



SITE SAFETY PLAN

Project Name: Cornell-Dubilier Electronics
South Plainfield, Middlesex County, New Jersey

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Prepared in Conjunction With

The Region II U.S. Environmental Protection Agency
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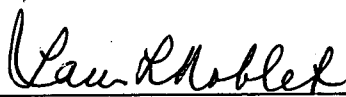
and

Roy F. Weston, Inc.
Superfund Technical Assessment and Response Team

For

The U.S. Environmental Protection Agency
Region II - Emergency and Remedial Response Division

Adopted By:



For Roy F. Weston, Inc.

Date:

6/26/96

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- Attachment B - HEAT STRESS
- Attachment C - CHEMICAL HAZARD INFORMATION (MSDS SHEETS)
- Attachment D - SITE SAFETY PLAN ACKNOWLEDGEMENT FORM
- Attachment E - SUMMARY OF POTENTIAL TOXOLOGICAL EFFECTS

GLOSSARY OF ACRONYMS

ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
APR	AIR PURIFYING RESPIRATOR
ACGIH	AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS
CFR	CODE OF FEDERAL REGULATIONS
CGI	COMBUSTIBLE GAS INDICATOR
CSEP	CONFINED SPACE ENTRY PERMIT
ERCS	EMERGENCY RESPONSE CLEAN-UP SERVICES
HNU-PID	HNU PHOTOIONIZATION DETECTOR
IDLH	IMMEDIATELY DANGEROUS TO LIFE & HEALTH
MREM/hr	MILLI-ROENTGENS EQUIVALENT IN MAN PER HOUR
NIOSH	NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY & HEALTH
OSC	ON-SCENE COORDINATOR
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
OVA	ORGANIC VAPOR ANALYZER
PPM	PARTS PER MILLION
RM	RESPONSE MANAGER
SCBA	SELF-CONTAINED BREATHING APPARATUS
SOP	STANDARD OPERATING PROCEDURE
SPCC	SPILL PREVENTION CONTROLS & COUNTERMEASURES
START	SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
TLV	THRESHOLD LIMIT VALUE
U.S. EPA	U.S. ENVIRONMENTAL PROTECTION AGENCY

1.0 INTRODUCTION AND SITE ENTRY REQUIREMENTS

This document describes the health and safety guidelines developed for this project to protect on-site personnel, visitors, and the public from physical harm and exposure to hazardous materials or wastes. The procedures and guidelines contained herein were based upon the best available information at the time of the plan preparation. Specific requirements will be revised when new information is received or conditions change and a safety plan modification is necessary to ensure the safety of workers or the public. A written amendment will document all changes made to the plan. Where appropriate, specific OSHA standards or other guidance will be cited and applied.

1.1 Daily Safety Meetings

Daily safety meetings will be held at the start of each shift to ensure that all personnel understand site conditions and operating procedures; to ensure that personal protective equipment is being used correctly; and to address worker health and safety concerns.

1.2 Site Safety Plan Acceptance Acknowledgement

The OSC or designated representative shall be responsible for informing all individuals entering the exclusion zone of the contents of this plan and ensuring that each person signs the Safety Plan Acknowledgement Form in Attachment D. By signing the Safety Plan Acknowledgement Form, individuals are recognizing the hazards present on site and the policies and procedures required to minimize exposure or adverse effects of these hazards.

1.3 Training Requirements

All personnel (including visitors) entering the exclusion zone must have completed training requirements for hazardous waste site work in accordance with OSHA 29 CFR 1910.120, or be qualified by previous training or experience. Documentation of training requirements is the responsibility of each employer. Personnel will also receive site-specific training including training to recognize the signs and symptoms of over-exposure to chemical hazards. Documentation of medical monitoring is the responsibility of each employer. If there are additional medical monitoring requirements for this site, evidence of compliance must also be included.

1.4 Medical Monitoring Requirements

All personnel (including visitors) entering the exclusion zone must have completed appropriate medical monitoring requirements required under OSHA 29 CFR 1910.120(f). Documentation of medical monitoring is the responsibility of the employer.

1.5 Fit Testing Requirements

All personnel (including visitors) entering the exclusion zone using a full-face negative pressure respirator must have successfully passed a qualitative respirator FIT test in accordance with OSHA 29 CFR 1910.1025; 1926.58; or, ANSI within the last 12 months. Documentation of FIT testing is the responsibility of each employer. If applicable, quantitative FIT testing is required for the use of negative pressure respirators for protection against airborne asbestos fibers, arsenic, and lead.

2.0 SITE BACKGROUND AND SCOPE OF WORK

The Cornell-Dubilier Electronics (CDE) site is located in the Hamilton Industrial Park, South Plainfield, Middlesex County, New Jersey. From 1956 to 1961, CDE operated at this location testing transformer oils. It is alleged that during this period of operation, the company dumped transformer oil contaminated with polychlorinated biphenyls (PCBs) directly on site soils. Former employees have reportedly claimed that transformers were buried behind the facility during the same time period. Currently, approximately 15 businesses operate in a portion of the buildings formally occupied by CDE. The property is approximately 25 acres in size. The buildings are located at the front of the property and occupy approximately 50% of the property. The remaining rear portion is comprised of an unused field with wetlands, part of which is fenced and utilized as a tractor trailer driver training school.

In June 1994 sampling was conducted at the site by the EPA Pre-Remedial Program in preparation of a Site Inspection Prioritization Report. A total of six surface soil samples were collected from a depth of 0-1 foot. Analytical data of one sample revealed high concentrations of contaminants, including: PCBs [1,100 parts per million (ppm)], lead (2,200 ppm), and cadmium (37 ppm). This sample location is situated in the area currently used by the truck driving school. PCBs were also detected in the other five samples at concentrations ranging from 68 ppm to 110 ppm. Other contaminants of concern include: arsenic, chromium, nickel, and silver. During driving practice, the trucks raise significant amounts of dust. In April 1996, air samples were collected along the fence-line of the tractor trailer driving school. Although PCBs were not detected, lead was present at low levels in these samples.

Task #	Description	Time Frame
1	Surface/subsurface soil sampling and sediment sampling	3 days

2.1 Roles and Responsibilities

2.1.1 OSC

The On-Scene Coordinator (OSC), as the representative of the U.S. EPA, is responsible for overall project administration and for coordinating health and safety standards for all individuals on site at all times. All applicable OSHA standards shall be observed. However, the START contractor (as an employer under OSHA) is also responsible for the health and safety of its employees. If there is any dispute with regards to health and safety, the following procedures shall be followed:

1. Attempt to resolve the issue on site; and,
2. If the issue cannot be resolved, on-site personnel shall consult off-site supervisors for assistance and the specific task/operation in dispute shall be discontinued until the issue is resolved.

2.1.2 START

The Superfund Technical Assessment and Response Team (START) is responsible for providing the OSC with assistance and support in regard to all technical, regulatory and safety aspects of site activity. The START is also available to advise the OSC on matters relating to sampling, treatment, packaging, labeling, transporting, and disposal of hazardous materials, but is not limited to the above mentioned items.

2.2 Key Personnel

U.S. EPA OSC:

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Site Health & Safety Officer:

Nick Magriples

Alternate Health & Safety Officer:

Christoph Stannik

START Representatives:

Christoph Stannik
Jennifer Leahy

2.3 Scope of Work for START

START will provide technical assistance and documentation for the site assessment. Duties will include air monitoring using a photoionization detector (PID), a flame ionization detector (FID, organic vapor analyzer), a CGI/O₂ (combustible gas indicator/oxygen meter), a Miniram particulate monitor and a radiation meter. START will collect surface/subsurface soil and sediment samples for off-site laboratory analysis. Other activities include any additional site-specific tasks which may require technical expertise.

3.0 TASK SAFETY AND HEALTH RISK ANALYSIS

This hazard assessment identifies the general hazards associated with specific site operations and presents an analysis of documented or potential chemical hazards that exist at the site. Every effort must be made to reduce or eliminate these hazards. Those which cannot be eliminated must be guarded against by use of engineering controls and/or personal protective equipment.

3.1 Activity-Specific Hazards and Standard Operating Procedures (SOPs)

The following section presents possible activity-specific site hazards and associated SOPs, if applicable.

3.1.1 Task-Specific Hazards and Preventive Measure

Task 1 - Soil and Sediment Sampling

<u>Hazard</u>	<u>Preventive Measure</u>
Inhalation of hazardous particles	Level C PPE; air monitoring.
Dermal contact with soil contaminants	PPE [Tyvek coverall (Saranex for sediment sampling), nitrile gloves, latex boots].
Slips, trips & falls	Area cleared; hazards identified.
Unexpected emergencies	Back-up personnel; Evacuation Plan.
Tick bites	PPE; visible inspection.
Heat Stress	Training; personnel monitoring (See Attachment B).

3.2 General Site Hazards

3.2.1 Lighting

Work areas must have adequate lighting for employees to see to work and identify hazards (5-foot candles) minimum comparable to a single 75-100 watt bulb). Personnel should carry flashlights in all normally dark areas for use in the event of a power failure. Applicable OSHA standards for lighting - 29 CFR 1910.120 (m) - shall apply.

3.2.2 Electrical Power

All electrical power must have a ground fault circuit interrupter as part of the circuit. All equipment must be suitable and approved for the class of hazard. Applicable OSHA standards for electrical - 29 CFR 1926 Subpart "K" shall apply.

3.2.3 Heat Stress

When the temperature rises above 75°F, heat stress protocol shall be followed. Attachment B provides heat stress signs, symptoms, and personnel monitoring guidance, as well as a sample Heat Stress Personnel Monitoring Log.

3.2.4 Eye Wash Protection

All operations involving the potential for eye injury, splash, etc., must have approved eye wash units locally available as per 29 CFR 1910.151 (c).

3.3 Chemical Hazards

The following substances were reported to have been detected in samples collected from site: PCBs, arsenic, cadmium, silver, lead, and nickel. The Material Safety Data Sheets (MSDSs) for these substances are provided in Attachment C. Attachment E provides a Summary of Toxicological Effects associated with these contaminants.

The following table presents contaminant-specific information, including Threshold Limit Values (TLVs), Permissible Exposure Limits (PELs), Routes of Exposure, Health Effects, and First Aid.

Contaminant	PEL/TLV/IDLH/ Routes of Exposure	Symptoms of Exposure	First Aid Procedures	
Arsenic metal	Carcinogen OSHA PEL - 0.010 mg/m ³ ACGIH TLV - 0.2 mg/m ³ IDLH - 5 mg/m ³ Routes of Exposure - Inh, Abs, Con, Ing	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, respiratory irritation, hyperpigmentation of skin, potential occupational carcinogen	Eye: Skin: Breath: Swallow:	Immediately wash w/large amounts of H ₂ O Soap wash immediately Respiratory support Get medical attention immediately
PCBs/Aroclor 1254	Carcinogen OSHA PEL - 0.5 mg/m ³ ACGIH TLV - 0.5 mg/m ³ IDLH - 5 mg/m ³ Routes of Exposure - Inh, Abs, Ing	Irritation of eyes, chloracne, liver damage, reproductive effects, potential occupational carcinogen	Eye: Skin: Breath: Swallow:	Immediately wash w/large amounts of H ₂ O Soap wash immediately Respiratory support Get medical attention immediately
Cadmium metal	Carcinogen OSHA PEL - 0.005 mg/m ³ ACGIH TLV - 0.05 mg/m ³ IDLH - 9 mg/m ³ Routes of Exposure - Inh, Ing	Pulmonary edema, dyspnea, cough, chest tight, substernal pain; headache; chills, muscles aches; nausea, vomiting, diarrhea; anosmia, emphysema, proteinuria, mild anemia; potential occupational carcinogen	Eye: Skin: Breath: Swallow:	Immediately wash w/large amounts of H ₂ O Soap wash immediately Respiratory support Get medical attention immediately
Chromium metal	OSHA PEL - 1 mg/m ³ ACGIH TLV - 0.5 mg/m ³ IDLH - 250 mg/m ³ Routes of Exposure - Inh, Ing, Con	Irritation of eyes, skin; lung fibrosis (histologic)	Eye: Skin: Breath: Swallow:	Immediately wash w/large amounts of H ₂ O Soap wash immediately Respiratory support Get medical attention immediately
Nickel metal	Carcinogen OSHA PEL - 1 mg/m ³ ACGIH TLV - 0.5 mg/m ³ IDLH - 10 mg/m ³ Routes of Exposure - Inh, Ing, Con	Sensitization, dermatitis, allergic asthma, pneumonitis; potential occupational carcinogen	Skin: Breath: Swallow:	Immediately flush w/water Respiratory support Get medical attention immediately
Lead	OSHA PEL - 0.050 mg/m ³ ACGIH TLV - 0.05 mg/m ³ IDLH - 100 mg/m ³ Routes of Exposure - Inh, Ing, Con	Weak, lassitude, insomnia; facial pallor; pal eye, anorexia, low weight, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis of wrist, ankles; encephalopathy; kidney disease; irritation of eyes; hypotension	Eye: Skin: Breath: Swallow:	Immediately wash w/large amounts of H ₂ O Wash w/soap promptly Respiratory support Get medical attention immediately

Contaminant	PEL/TLV/IDLH/ Routes of Exposure	Symptoms of Exposure	First Aid Procedures	
Silver metal	OSHA PEL - 0.01 mg/m ³ ACGIH TLV - 0.1 mg/m ³ IDLH - 10 mg/m ³ Routes of Exposure - Inh, Ing, Con	Blue-gray eyes, nasal septum, throat, skin; irritation, ulceration of skin; gastrointestinal disturbances	Eye: Skin: Breath: Swallow:	Immediately wash w/large amounts of H ₂ O Flush w/water Respiratory support Get medical attention immediately

Sources: NIOSH Pocket Guide to Chemical Hazards, June 1994; Material Safety Data Sheets, Genium Publishing Corporation.

3.4 Fire Protection/Fire Prevention

Operations involving the potential for fire hazards shall be conducted in a manner as to minimize the risk. Non-sparking tools and fire extinguishers shall be used or available as appropriate. Sources of ignition shall be removed. When necessary, explosion-proof instruments and/or bonding and grounding will be used to prevent fire or explosion.

3.5 Utilities

Overhead utility hazards shall be identified and/or inspected prior to conducting operations involving potential contact.

4.0 **TRAINING AND FIT TESTING REQUIREMENTS**

Refer to Introduction for Site Entry Requirements (Sections 1.3 and 1.5).

5.0 **PERSONAL PROTECTIVE EQUIPMENT (PPE)**

The following provides a brief description of the PPE which may be required during various phases of the project. The U.S. EPA terminology for protective equipment will be used (i.e., Levels A, B, C and D).

Respiratory protective equipment shall be NIOSH-approved and use shall conform to OSHA 29 CFR Part 1910.134 requirements. Each employer shall maintain a written respirator program detailing selection, use, cleaning, maintenance and storage of respiratory protective equipment. If requested, each employer may be required to provide the documentation necessary to indicate compliance with this regulation.

A comprehensive, written PPE program is available that is specific to site operations and addresses the following: site hazards; duration of site activity; limitations of PPE during temperature extremes; PPE selection, use, maintenance and storage; decontamination procedures; training and proper fitting, donning and doffing procedures; and inspection and in-use monitoring.

5.1 Level A Protection

Level A protection shall be used when:

- The extremely hazardous substance requires the highest level of protection for skin, eyes and the respiratory system;
- Substances with a high degree of hazard to the skin are known or suspected;
- Chemical concentrations are known to be above IDLH levels;
- Biological hazards requiring Level A are known or suspected; or,
- Unknown organic vapor concentrations range from 500 - 1,000 units.

5.1.1 Level A Protective Equipment

Level A protection equipment consists of:

- Fully encapsulating exposure suit (selected for resistance to chemicals at the site);
- Chemical resistant boot covers worn over safety-toe work boots;
- Chemical resistant outer gloves (disposable);
- Chemical resistant inner gloves (disposable);
- Pressure demand SCBA or airline system with approved emergency escape system;
- Hard hat;
- Disposable outer suit (optional);
- Use of the "buddy system" for site entry personnel and appropriate back-up support personnel.

5.2 Level B Protection

Level B protection shall be used when:

- The substances have been identified and require a high level of respiratory protection but less skin protection;
- Concentrations of chemicals in the air are IDLH or above the maximum use limit of an APR with full-face mask;
- Oxygen deficient or potentially oxygen deficient atmospheres (<19.5%) are possible;
- Confined space entry requires Level B; or,
- Unknown organic vapor concentrations range from 5 to 500 units, but are not suspected of containing high levels of chemicals harmful to the skin or capable of being absorbed through intact skin.

5.2.1 Level B Protective Equipment

Level B protective equipment consists of:

- Chemical-resistant coverall: Saranex-type or Barricade;
- Steel-toe work boots with chemical-resistant overboots or disposable rubber boot covers;
- Disposable inner gloves - surgical type;
- Disposable outer gloves - Neoprene, Solvex, or Nitrile;
- Supplied air - pressure demand SCBA or airline system with approved emergency escape system;
- Hard hat; and,
- All joints taped with duct tape.

NOTE: Use of Level B personal protective equipment requires that during initial site entries, two (2) persons must be available as backup ready to provide emergency assistance.

5.3 Level C Protection

Level C protection equipment shall be used when:

- The same level of skin protection as Level B, but a lower level of respiratory protection is required;
- The types of air contaminants have been identified, concentrations measured, and an air-purifying respirator is available that can remove contaminants;
- The substances have adequate warning properties and all criteria for the use of APR respirators has been met; and,
- 1-5 units of unknown organic vapors above background levels are anticipated.

5.3.1 Level C Protective Equipment

Level C protective equipment at a minimum consists of:

- Chemical-resistant coverall - Paper or Saranex Tyvek (paper Tyvek will be used only if no splash hazard is present);
- Steel-toe work boots with chemical-resistant overboots or disposable rubber boot covers;
- Disposable inner gloves - Nitrile;
- Disposable outer gloves - Nitrile;
- Full-face air purifying respirator (APR);
- Chemical cartridge or canister type for organic vapors, dusts, and mists (e.g., MSA type GMC-H or equivalent);
- Hard hat and;
- All joints taped with duct tape.

5.4 Level D+ Protection (Level D Upgrade)

Level D/D+ protection shall be used when:

- The atmosphere contains no known hazard; and,
- Work functions preclude splashes, immersion or the potential for unexpected inhalation of, or contact with, hazardous concentrations of harmful chemicals.

5.4.1 Level D+ Protection Equipment

Level D+ protective equipment at a minimum consists of:

- Chemical-resistant coverall - Paper Tyvek (paper Tyvek will be used only if no splash hazard is present);
- Safety-toe work boots;
- Disposable inner gloves - Nitrile;
- Disposable outer gloves - Nitrile;
- Safety glasses;
- Splash shield as needed*;
- Hard hat; and,
- All joints taped with duct tape.

* Professional judgement will be used when determining necessity of utilization of splash shield (e.g., situations where there is a potential for a splash hazard).

5.5 Activity-Specific Levels of Protection

The required level of protection is specific to the activity being conducted. At this site the minimum levels of protection are as follows:

<i>Activity</i>	<i>Level of Protection</i>
Soil and Sediments Sampling	C/D+*

*NOTE: All work in Level C and Level D+ will be performed with continuous air monitoring, unless air monitoring results warrant upgrading to Level B (e.g., readings above 5 units with the PID or OVA, or above the TLV of known contaminants). While working in Level D+, an upgrade to Level C will be enacted when air monitoring readings range from >0 to 5 units above background concentration or if dry and dusty conditions prevail.

6.0 MEDICAL MONITORING REQUIREMENTS

Refer to Introduction for Site Entry Requirements (Section 1.4).

7.0 AIR MONITORING AND ACTION LEVELS

According to 29 CFR 1910.120 (h), air monitoring shall be used to identify and quantify airborne levels of hazardous substances and health hazards in order to determine the appropriate level of employee protection needed on site.

7.1 Routine Air Monitoring Requirement

The following items present the routine air monitoring requirements:

- Upon initial entry, representative air monitoring shall be conducted to identify IDLH conditions, exposure above OSHA-PELs or other published exposure levels including exposure to radiation, flammable atmospheres, and/or oxygen deficient atmospheres.
- When the possibility of an IDLH condition or flammable atmosphere has developed;
- When work begins on a different portion of the site;
- Contaminants other than those previously identified are being handled;
- A different type of operation is initiated;
- Employees are handling leaking drums or containers or working in areas with obvious liquid contamination; and
- Continuously during confined space work; and
- At the end of daily site operations.

At a minimum, air monitoring will consist of the criteria listed below. All air monitoring data will be documented and submitted to the OSC and available in the command post site files for review by all interested persons. Air monitoring instruments will be calibrated and maintained in accordance with the manufacturers' specifications.

7.2 Site-Specific Air Monitoring Requirements

<i>Instrument</i>	<i>Compounds to Detect</i>	<i>Frequency</i>	<i>Comments/ Action Level</i>
Combustible Gas Indicator (CGI)	Explosive/Flammable Atmosphere	Continuously during Level C operations & as in Sections 5 and 7.1	> 20 % LEL - Operations cease and corrective actions taken
Oxygen Meter	Oxygen	Continuously during Level C operations & as in Sections 5 and 7.1	< 19.5 % - Wear SCBA; CGI readings invalid 19.5 - 23 % - Normal ambient air > 23 % - Evacuate, investigate cause and mitigate
Hnu-PID & OVA	Organic Vapors & Gases	Continuously during Level C operations & as in Sections 5 and 7.1	> 5 units - Upgrade to Level B Background to 5 units - Level C ≈ TLV - Upgrade to Level B for known contaminants > 500 units - Upgrade to Level A
LUDLUM MODEL 19 MICRO R METER	Low Level Gamma Radiation	Initial Site Entry	Action Level = 3 times background radiation. Operation ceases above action level.
MiniRAM Monitor	Particulates/nuisance dust	Continuously during sampling operations	> 0.01 mg/m ³ above background: upgrade to Level C

8.0 SITE CONTROL AND STANDARD OPERATING PROCEDURES

8.1 Work Zones

The primary purpose for site controls is to establish the hazardous area perimeter, to reduce migration of contaminants into clean areas, and to prevent access or exposure to hazardous materials by unauthorized persons. At the end of each work day, the site should be secured or guarded to prevent unauthorized entry, if applicable. The following subsections provide descriptions of the site work zones.

8.1.1 Exclusion Zone

The exclusion zone will be the "hot-zone" or contaminated area inside the site perimeter. Entries to and exit from this zone will be made through one designated point. Exit from the exclusion zone must be accompanied by personnel and equipment decontamination as described in Section 9.0.

8.1.2 Decontamination Zone

The decontamination zone will provide a location for removal of contaminated PPE and final decontamination of personnel and equipment. All personnel and equipment should exit only via the decon area. A separate decontamination area will be established for heavy equipment. The decon area will be established during the initial site reconnaissance.

8.1.3 Clean Zone

The uncontaminated support zone, or clean zone, will be the area outside the exclusion and decontamination zones and within the geographic perimeters of the site. This area is used for staging materials, parking vehicles, office and laboratory facilities, sanitation facilities, and receipt of deliveries. Personnel entering this zone may include delivery personnel, visitors, security guards, etc., who will not necessarily be permitted in the exclusion zone. There will be one controlled entry/exit point from the clean zone to the decontamination zone.

All personnel arriving in the support zone should, upon arrival, report to the command post and sign the site entry/exit log. A work zone location map will be developed upon their determination.

8.2 General Field Safety and Standard Operating Procedures

- The "buddy system" will be used at all times by all field personnel. No one is to perform field work alone. Maintain visual, voice or radio communication at all times. Any failure of radio communication will require an evaluation of whether personnel should leave the exclusion zone. An emergency signal consisting of a horn blast will be used to indicate that all personnel should leave the exclusion zone;

- Whenever possible, avoid contact with contaminated or potentially contaminated surfaces. Walk around, not through, puddles and discolored surfaces. Do not kneel on or set equipment on the ground. Stay away from any waste drums unless necessary. Protect equipment from contact by bagging;
- Eating, drinking, or smoking is permitted only in designated areas in the support zone;
- Hands and face must be thoroughly washed upon leaving the work area and before eating, drinking, or any other activities;
- Beards or other facial hair that interferes with respirator fit are prohibited;
- All equipment must be decontaminated or discarded upon exit from the exclusion zone;
- All personnel exiting the exclusion zone must go through the decontamination procedures described in Section 9.0;
- Safety equipment described in Section 5.0 will be required for all field personnel unless otherwise approved by the Site Health and Safety Officer; and
- Practice administrative hazard control for all site areas by restricting entrance to exclusion zones to essential personnel and by using operational SOPs.

9.0 DECONTAMINATION PROCEDURES

In general, anything that enters the exclusion zone at this site must either be decontaminated or properly discarded upon exit from the exclusion zone. All personnel, including any state and local personnel, must enter and exit the hot zone through the decon area. Prior to demobilization, contaminated equipment will be decontaminated and inspected before it is moved into the clean zone. All material that is generated by decontamination procedures will be stored in a designated area until disposal arrangements are made.

All personnel must sign the "Hot Zone Entry/Exit Log" when entering and exiting the exclusion zone.

NOTE: The type of decontamination solution to be used is dependent on the type of chemical hazards. The decontamination solution for this site is soap and water. Decontamination solution will be changed daily (at a minimum) and collected and stored on site until disposal arrangements are finalized. If at all possible, rinse water will be minimized and all PPE will be placed in plastic bags (dry decontamination) and will be secured and disposed of properly at the close of sampling activities.

9.1 Procedures for Equipment Decontamination

Following decontamination and prior to exit from the hot zone, the OSC or a designated alternate shall be responsible for insuring that the item has been sufficiently decontaminated. For small hand-held equipment, a minimum two-step equipment decontamination procedure shall be used. An Alconox (or similar detergent) and water wash shall be followed by a water rinse. The water used in the decontamination procedure shall be considered as hazardous and be disposed of as such. A decontamination pad shall be constructed. The pad shall be constructed out of plastic sheeting and/or other impermeable barriers. As per OSC direction, heavy equipment will be steam-cleaned in place between test pit excavations and after completion of excavation activities.

9.2 Procedure for Personnel Decontamination

This decontamination procedure applies to personnel at this site wearing Level B and C protection. These are the minimum acceptable requirements:

Station 1: Segregated Equipment Drop

Deposit equipment used on site (tools, sampling devices, monitoring instruments, radios, etc.) on plastic drop cloths. These items must be decontaminated or discarded as waste prior to removal from the exclusion zone.

Station 2: Outer Boot and Outer Glove Wash and Rinse

Scrub outer boots and outer gloves with decontamination solution or detergent water. Rinse off using large amounts of water.

Station 3: Outer Boot and Glove Removal

Remove outer boots and gloves. If outer boots are disposable, deposit in container with plastic liner. If non-disposable, store in a clean dry place.

Station 4: Outer Garment Removal

Remove chemical-resistant outer garments and deposit in container lined with plastic. Dispose of splash suits as necessary.

Station 5: Respiratory Protection Removal

Remove hard hat, face piece, and if applicable, deposit SCBA on plastic sheets. APR cartridges will be discarded as appropriate. Wash and rinse respirator at least daily. Wipe off SCBA and store in safe place.

Station 6: Inner Glove Removal

Remove inner gloves. Deposit in container for disposal.

Station 7: Field Wash

Thoroughly wash hands and face with soap and water. Shower as soon as possible.

Note: If a wet personnel decontamination procedure is deemed unnecessary, all protective clothing will simply be removed and bagged.

10.0 EMERGENCY RESPONSE PLAN

It is essential that site personnel be prepared in the event of an emergency. Emergencies can take many forms: illnesses or injuries, chemical exposure, fires, explosions, spills, leaks, releases of harmful contaminants, or sudden, severe changes in the weather. The following sections outline the general procedures for emergencies. Emergency information should be posted as appropriate.

10.1 Pre-Emergency Planning

During the site briefings held prior to field work, all employees will be trained in and reminded of provisions of the emergency response plan, communication systems, and evacuation routes. Section 7.1 identifies the hazardous conditions associated with specific site activities. The plan will be reviewed by the START RSO and revised if necessary. This will ensure that the plan is adequate and consistent with prevailing site conditions.

10.2 Emergency Phone Contacts

<u>Fire:</u>	South Plainfield Fire Dept.	911
<u>Police:</u>	South Plainfield Police	911
<u>Ambulance:</u>	South Plainfield	911
<u>Hospital:</u>	Muhlenburg Hospital	(908) 668-2405
	<u>Chemical Trauma Capabilities?</u>	Yes

Poison Control Center (NJ): 1-800-764-7661

Directions to Hospital (Hospital Route Map included in Attachment A, Figure 2):

Take a right out of the business complex onto Hamilton Avenue. Proceed to the first light and make a right onto Maple Ave. Proceed on Maple Avenue to the next light and make a left onto Park Avenue. The hospital is approximately 1 mile down on the right. For the emergency entrance, proceed to end of block and turn right onto Randolph Avenue.

Chemtrec	(800) 424-9300
TSCA Hotline	(800) 424-9065
	(202) 544-1401
ATSDR	(404) 329-3311 (Day)
	(404) 639-0615 (Night)
AT & F (Explosives Information)	(800) 424-9555
National Response Center	(800) 424-8802
Weston Medical Emergency Service	(800) 229-3674
Weston 24 Hour Hotline	(215) 524-1925 or 1926
Pesticide Information Service	(800) 845-7633
EPA Emergency Response Team (ERT)	(908) 321-6660
RCRA Hotline	(800) 424-9346
CMA Chemical Referral Center	(800) 262-8200
National Poison Control Center	(800) 942-5969
U.S. DOT	(202) 366-0656 (Day only)
	(202) 426-2075 (Hotline)
Weston START Office	(908) 225-6116
U.S. EPA Region Hot Line	(201) 548-8730

10.3 Emergency Equipment Available on Site

Communications Equipment*

Location

Successful communications between field teams and contact with personnel in the support zone are essential, as is communication with off-site agencies such as police and fire. The following communications systems will be available during activities at the Site (check all systems that apply):

- _____ Intrinsically Safe Radio
- _____ Compressed Air Horn
- _____ Hand Signals
- _____ Public Telephone (location and number - to be determined)
- _____ Site Telephone (location - N/A) (number - N/A)
- _____ Portable Telephone (location - START vehicle) (number -to be determined)

All on-site personnel shall be familiar with the meanings of the following hand signals:

Hand Signal	Definition
-----	-----
Hands clutching throat	Out of air/cannot breath
Hands on top of head	Needs assistance
Thumbs up	OK/I am all right/I understand
Thumbs down	No/negative
Arms waving upright	Send backup support
Grip partners wrist	Exit area immediately

Medical Equipment

First Aid Kits:	START vehicle/decon area.
Inspection Date:	First day of sampling by START personnel.
Eye Wash Station	First Aid Kit.

10.4 Project Personnel Responsibilities during Emergencies

10.4.1 OSC

As the administrator of the project, the OSC has primary responsibility for responding to and correcting emergency situations. The OSC must:

- Take appropriate measures to protect personnel including: withdrawal from the exclusion zone, upgrading or downgrading the level of protective clothing and respiratory protection, or total evacuation and securing of the site;
- Take appropriate measures to protect the public and the environment, including isolating and securing the site, preventing runoff to surface waters and ending or controlling the emergency to the extent possible;
- Ensure that appropriate federal, state and local agencies are informed, and emergency response plans are coordinated. In the event of fire or explosion, the local fire department should be summoned immediately. In the event of an air release of toxic materials, the local authorities should be informed in order to assess the need for evacuation. In the event of a spill, sanitary districts and drinking water systems may need to be alerted;
- Ensure that appropriate treatment or testing for exposed or injured personnel is obtained;

- Determine the cause of the incident and make recommendations to prevent the recurrence; and,
- Ensure that all required reports have been prepared.

10.4.2 START

The START must immediately report emergency situations to the OSC, take appropriate measures to protect site personnel, and assist the OSC as necessary.

10.5 Medical Emergencies

Any person who becomes ill or injured in the exclusion zone must be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination should be completed and first aid administered prior to transport. If the patient's condition is serious, at least partial decontamination should be completed (i.e., complete disrobing of the victim and redressing in clean coveralls or wrapping in a blanket.) First aid should be administered while awaiting an ambulance or paramedics. All injuries and illnesses must immediately be reported to the OSC.

Any person being transported to a clinic or hospital for treatment should take along information on the chemical(s) they have been exposed to at the site. This information is included in Attachment C.

Any vehicle used to transport contaminated personnel will be tested and cleaned, as necessary.

10.6 Site Security/Control

During any emergency situation it is important that site security and control are maintained. The OSC or designated alternate emergency coordinator will be responsible for ensuring that no individuals are allowed to enter the site or be put in any danger due to the nature of the emergency situation on the site.

10.7 Emergency Recognition/Prevention

Personnel will be familiar with techniques of hazard recognition from pre-assignment training and site-specific briefings. The RSO is responsible for ensuring that prevention devices or equipment are available to personnel. The following presents a list of potential hazards and prevention/control measures:

<u>HAZARD</u>	<u>PREVENTION/CONTROL</u>	<u>LOCATION</u>
Fire/Explosion	Fire Extinguisher Alarm System Fire Inspections	To Be Determined
Spill	Berms/Dikes Sorbent Materials Foams	To Be Determined
Air Release	Water Spray Foam Alarm System Evacuation Routes	To Be Determined

The locations of the equipment will be discussed during the site specific briefing and periodically during the project.

10.7.1 Fire or Explosion

In the event of a fire or explosion, the local fire department should be summoned immediately. Upon their arrival, the PM or designated alternate will advise the fire commander of the location, nature, and identification of the hazardous materials on site.

If it is safe to do so, site personnel may:

- o Use fire fighting equipment available on site to control or extinguish the fire; and,
- o Remove or isolate flammable or other hazardous materials which may contribute to the fire.

10.7.2 Spill or Leak

In the event of a spill or a leak, site personnel will:

- o Inform their supervisor immediately;

- o Locate the source of the spillage and stop the flow if it can be done safely; and,
- o Begin containment and recovery of the spilled materials.

In the event of a spill or a leak, site personnel will:

- Inform their supervisor immediately;
- Locate the source of the spillage and stop the flow if it can be done safely; and,
- Begin containment and recovery of the spilled materials.

Spill prevention and response procedures will be used to prevent additional spillage at the site and to mitigate existing discharges. Spill Prevention Control and Countermeasures (SPCC) procedures are generally defined in 40CFR112.

Potentially hazardous spill situations will be reduced by supplying containment devices and materials in work areas. If site conditions are suitable, earthen berms will be constructed around specific areas. If site conditions are not suitable, or the potential spill is on a smaller scale, barriers will be constructed with sorbent materials such as "speedi-dry" and/or sorbent booms. Dikes and berms will also be used to divert run-on and run-off from critical zones.

Since a spill cleanup process must be conducted under crisis conditions, it is important that the methods used for dealing with a spill be considered beforehand. However, steps used in this procedure must be flexible because no two emergencies are exactly the same. Alternative steps must be available if problems should arise in a given cleanup operation. Factors to be assessed in the event of a spill include:

- Volume of hazardous substance released and the rate of release;
- Nature of the spill area and spill material;
- Dangers existing to personnel in the immediate area;
- Nature of damage and possibilities of repair;
- Possibility of transferring the material to an alternate container;
- Feasibility of construction of a containment dike;
- Potential for the spilled substance to reach surface waters or a sewer;
- Danger of explosion or fire;
- Equipment and supplies necessary to confine the substance and complete treatment.

In most cases, the success of a cleanup operation is dependent upon the time needed to contain the spill. Therefore, the first attempt at spill containment will be at the point of discharge. This can often be accomplished by closing valves, reinforcing or repairing damaged containers, moving or

changing the position of fallen or ruptured containers, or emptying the container by pumping to a temporary storage or holding vessel.

Spill response will follow existing START procedures and organizational protocol. For this project, the subcontractor will provide absorbent materials and overpack containers to handle spills of transformers or drums discovered during test pit excavating.

In the event of a spill, the drum handling team shall immediately contact the START Project Manager who will have all personnel evacuated from the immediate spill area. Personnel trained in spill response procedures shall isolate and contain the spill. Where possible, spilled waste material shall be collected and placed in repack containers for ultimate disposal. Following containment and collection of spilled waste, the area shall be surveyed by the Safety Officer and declared safe prior to reentry of work teams.

10.8 Evacuation Routes and Resources

In the event of an emergency which necessitates an evacuation of the site, the following alarm procedures will be implemented:

Evacuation alarm notification should be made using three short blasts on the air horn, supplemented by the use of hand-held radios. All personnel should evacuate to a location upwind of any activities. Ensure that a predetermined location is identified off site in case of an emergency, so that all personnel can be accounted for. The predetermined location will be identified during the daily safety meeting.

Personnel will be expected to proceed to the closest exit with your buddy, and mobilize to the safe distance area associated with the evacuation route. Personnel will remain at that area until the re-entry alarm is sounded or an authorized individual provides further instructions.

10.9 Safe Distances and Places of Refuge

No single recommendation can be made for evacuation or safe distances because of the wide variety of emergencies which could occur. Safe distances can only be determined at the time of an emergency based on a combination of site and incident-specific criteria. However, the following measures are established to serve as general guidelines.

In the event of minor hazardous materials releases (small spills of low toxicity), workers in the affected area will report initially to the contamination reduction zone. Small spills or leaks (generally less than 55 gallons) will require initial evacuation of at least 50 feet in all directions to allow for cleanup and to prevent exposure. After initial assessment of the extent of the release and potential hazards, the emergency coordinator or his designee will

determine the specific boundaries for evacuation. Appropriate steps such as caution tape, rope, traffic cones, barricades, or personal monitors will be used to delineate and secure the boundaries.

In the event of a major hazardous material release (large spills of high toxicity/greater than 55 gallons), workers will be evacuated from the building/site. Workers will assemble at the entrance to the site for a head count by emergency coordinator and to await further instruction.

If an incident may threaten the health or safety of the surrounding community, the public will be informed and, if necessary, evacuated from the area. The emergency coordinator, or his designee will inform the proper agencies in the event that this is necessary.

Places of refuge will be established prior to the commencement of activities. These areas must be identified for the following incident:

- o Chemical release
- o Fire/explosion
- o Power loss
- o Medical emergency
- o Hazardous weather

In general, evacuation will be made to the command post, unless the emergency coordinator determines otherwise. It is the responsibility of the emergency coordinator to determine when it is necessary to evacuate personnel to off-site locations.

In the event of an emergency evacuation, all the employees will gather at the entrance to the site until a head count establishes that all are present and accounted for. No one is to leave the site without notifying the emergency coordinator.

10.10 Site Topography, Layout and Weather Conditions

Prior to work beginning at a site it is important to note particulars about that site that might be important during an emergency situation. In particular, it is important to note specifics about the site topography, the layout of the site and any special weather conditions that are known or are expected to occur. This information should then be used to ensure that emergency response planning has taken into account site-specific requirements.

Site Topography - As determined by the USGS Topographic Map quadrangle for the area of the site, the property is relatively flat. However, toward the on-site brook, the ground slopes moderately until levelling out at surface water.

Layout - The sampling areas are located primarily in the access road and in the open field. Collection of the access road samples will be conducted on Saturday, at a time of low volume of vehicular traffic.

Weather Conditions - _____

10.11 Accident Report

For all occupational injuries, accident, and/or illness that occurs on site, an Employee Incident Report must be filled out and given to the START RSO.

Attachment A

Plainfield Quadrangle
New Jersey
7.5 Minute Series (Topographic)
1955 (Photorevised 1981)

SITE LOCATION

SOUTH PLAINFIELD (BM 67)

Roosevelt Sch

Sacred Heart Sch

Post Office

CONRAIL

BORO

BDY

INTERCHANGE

New Durham

Spring Ln

Brook

OAK TREE

WATER

57

80

100

120

140

160

180

200

220

240

260

280

300

320

340

360

380

400

420

440

460

480

500

520

540

560

580

600

620

640

660

680

700

720

740

760

780

800

820

840

860

880

900

920

940

960

980

1000

Scale 1: 24 000 1" = 2,000 feet
Contour interval 20 Feet
Source: US Geological Survey

NEW JERSEY
QUADRANGLE LOCATION

Scale 1: 24 000 1" = 2,000 feet
Contour interval 20 Feet
Source: US Geological Survey

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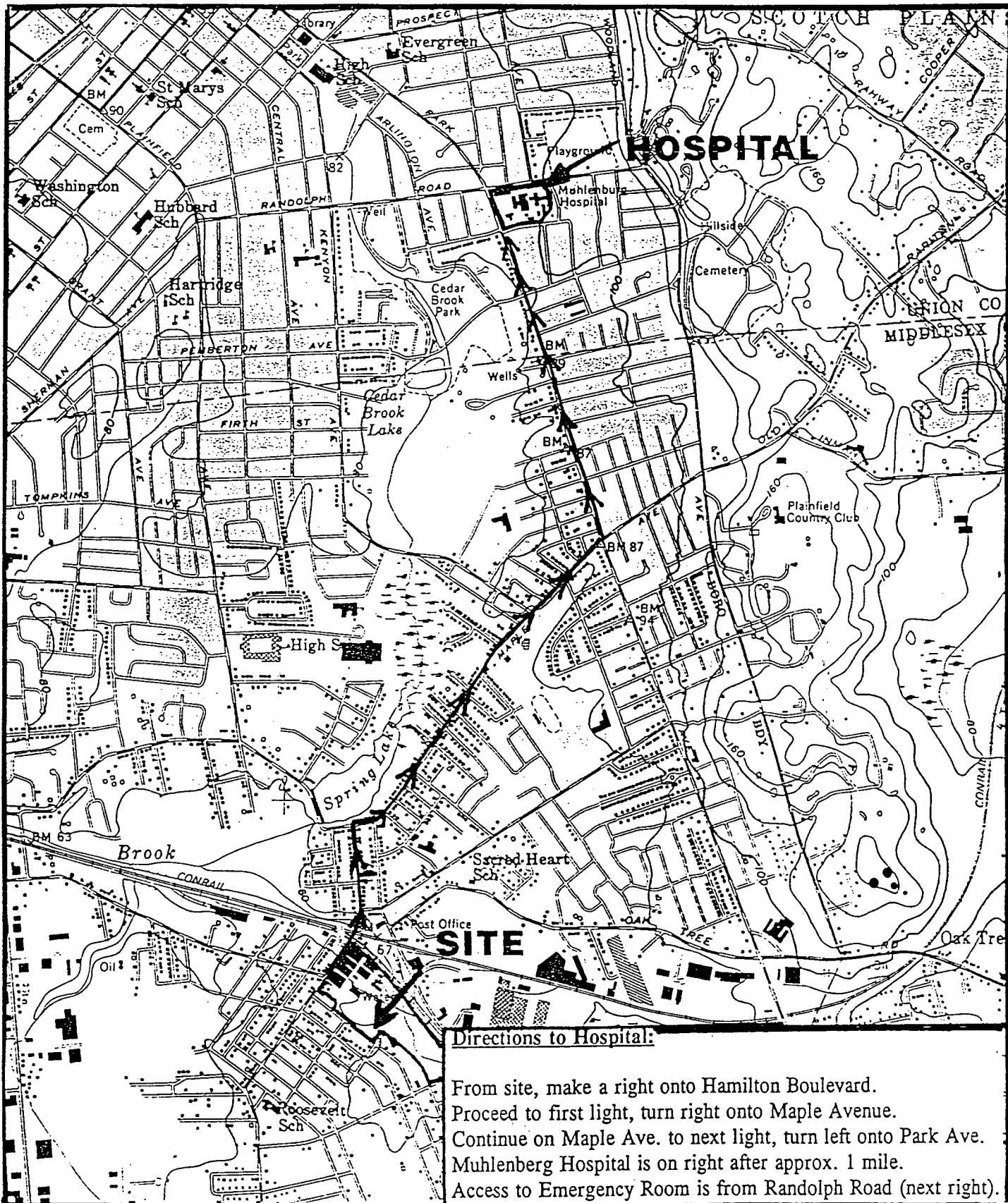
EPA PM

N. Magriples

Cornell-Dubilier
Electronics
S. Plainfield, NJ

START PM
K. Campbell

Figure 1:
Site Location Map



Directions to Hospital:

From site, make a right onto Hamilton Boulevard.
 Proceed to first light, turn right onto Maple Avenue.
 Continue on Maple Ave. to next light, turn left onto Park Ave.
 Muhlenburg Hospital is on right after approx. 1 mile.
 Access to Emergency Room is from Randolph Road (next right).



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IN ASSOCIATION WITH RESOURCE APPLICATION, Inc.
 C.C. JOHNSON & MALHOTRA, P.C., R.E. SARRIERA ASSOCIATES,
 PRC ENVIRONMENTAL MANAGEMENT, AND GRB ENVIRONMENTAL SERVICES, INC.

EPA PM

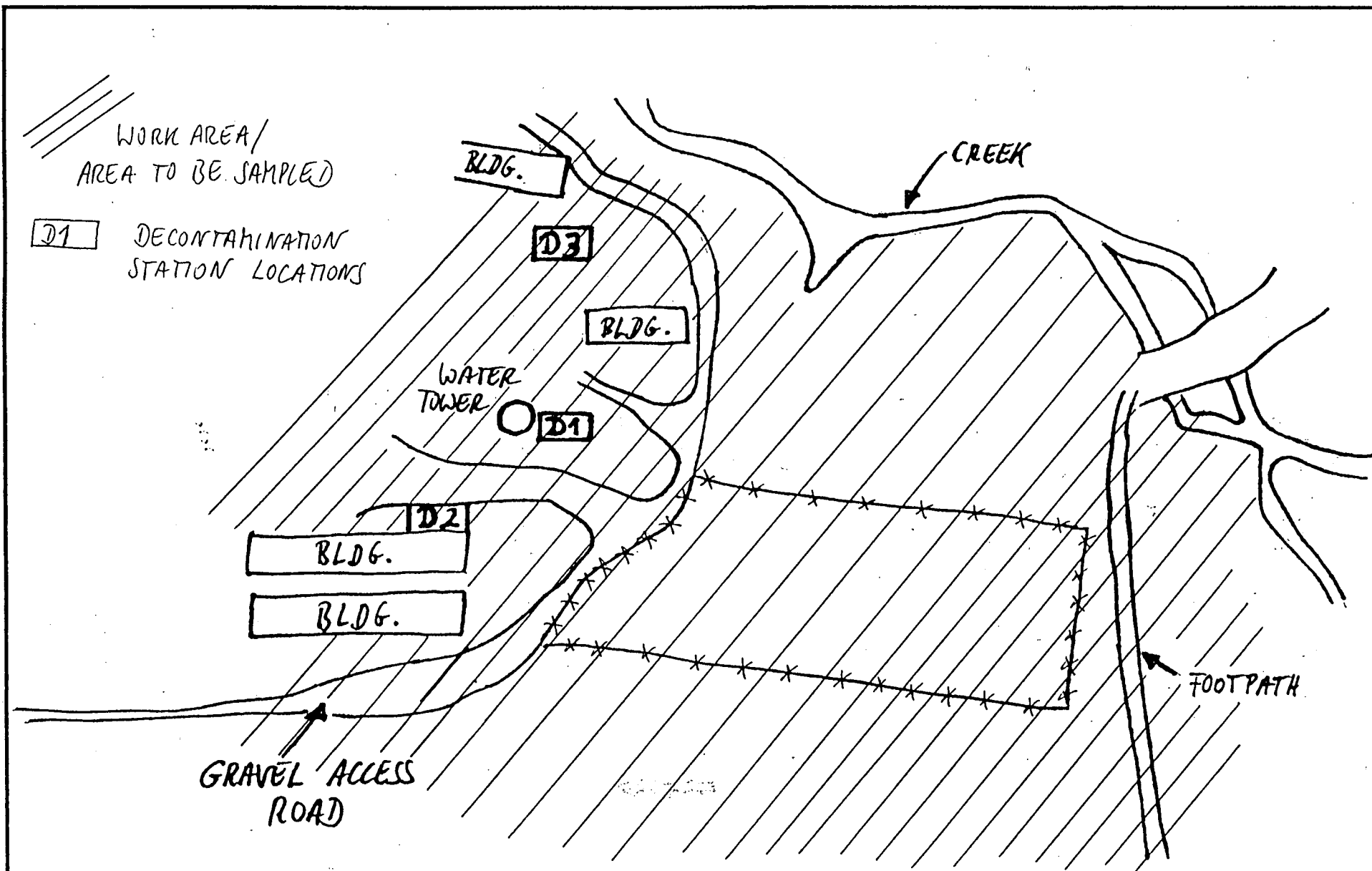
N. Magriples

START PM

K. Campbell

Cornell-Dubilier
 Electronics
 S. Plainfield, NJ

Figure 2:
 Hospital Route



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PRC ENVIRONMENTAL MANAGEMENT, AND GRB ENVIRONMENTAL SERVICES, INC.

EPA PM
N. Magriples

START PM
K. Campbell

Cornell-Dubilier Electronics
S. Plainfield, NJ

Figure 3:
Site Sketch & Work Areas

Attachment B

HEAT STRESS

EFFECTS OF HEAT STRESS

If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur ranging from mild (such as fatigue, irritability, anxiety, and decreased concentration, dexterity, movement) to fatal. Standard reference books should be consulted for specific treatment.

HEAT-RELATED PROBLEMS

Heat Rash

Heat rash is caused by continuous exposure to heat and humid air and aggravated by chafing clothes. Heat rash also decreases the ability to tolerate heat as well as being a nuisance.

Heat Cramps

Heat cramps usually affect people who work in hot environments and perspire a great deal. Loss of salt from the body causes very painful cramps of the leg and abdominal muscles. Heat cramps may also result from drinking iced water or other drinks either too quickly or in too large a quantity. The symptoms of heat cramps are as follows:

- * Muscle cramps in legs and abdomen
- * Pain accompanying cramps
- * Faintness
- * Profuse perspiration

To provide emergency care for heat cramps, remove the patient to a cool place. Give him sips of liquids such as "Gatorade" or its equivalent. Apply manual pressure to the cramped muscle. Remove the patient to a hospital if there is any indication of a more serious problem.

Heat Exhaustion

Heat exhaustion occurs in individuals working in hot environments. This disorder may be associated with heat cramps. It is brought about by the pooling of blood in the vessels of the skin. The heat is transported from the interior of the body to the surface by the blood. The skin vessels become dilated and a large amount of blood is pooled in the skin. This condition, plus the blood pooled in the lower extremities when in an upright position, may lead to an

inadequate return of blood to the heart and eventually to physical collapse. The symptoms of heat exhaustion are:

- * Weak pulse
- * Rapid and usually shallow breathing
- * Generalized weakness
- * Pale, clammy skin
- * Profuse perspiration
- * Dizziness
- * Unconsciousness
- * Appearance of having fainted (the patient responds to the same treatment administered in cases of fainting).

To provide emergency care of heat exhaustion, remove the patient to a cool place and remove as much clothing as possible. Administer cool water, "Gatorade" or its equivalent. If possible, fan the patient continually to remove heat by convection, but do not allow chilling or overcooling. Treat the patient for shock, and remove him to a medical facility if there is any indication of a more serious problem.

Heat Stroke

Heat stroke is a profound disturbance of the heat-regulating mechanism, associated with high fever and collapse. Sometimes this condition results in convulsions, unconsciousness and even death. Direct exposure to sun, poor air circulation, poor physical condition, and advanced age (over forty) bear directly on the tendency to heat stroke. It is a serious threat to life and carries a twenty percent mortality rate. Alcoholics are extremely susceptible. The symptoms of heat stroke are:

- * Sudden onset
- * Dry, hot and flushed skin
- * Dilated pupils
- * Early loss of consciousness
- * Full and fast pulse
- * Breathing deep at first, later shallow and even almost absent.

- * Muscle twitching, growing into convulsions.
- * Body temperature reaching 105 to 106 degrees or higher.

When providing emergency care for heat stroke, remember that this is a true emergency. Transportation to a medical facility should not be delayed. Remove the patient to a cool environment if possible, and remove as much clothing as possible. Assure an open airway. Reduce body temperature promptly by dousing the body with water, or preferably by wrapping in a wet sheet. If cold packs are available place them under the arms, around the neck, at the ankles, or any place where blood vessels that lie close to the skin can be cooled. Protect the patient from injury during convulsions, especially from tongue biting.

HEAT STRESS MONITORING

All supervisors should ensure that their personnel are briefed on the hazards, symptoms, and treatment of heat related problems. For monitoring the body's recuperative ability to excess heat, one or more of the following techniques should be used as a screening mechanism. Monitoring of personnel wearing impervious clothing should commence when the ambient temperature is 70°F or above. Frequency of monitoring should increase as the ambient temperature increases or as slow recovery rates are indicated. When temperatures exceed 85°F, workers should be monitored for heat stress after every work period.

1. Heart rate (HR) should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats per minute. If the HR is higher, the next work period should be shortened by 10 minutes (or 33%), while the length of the rest period stays the same. If the pulse rate is 100 beats per minute at the beginning of the next rest period, the following work cycle should be shortened by 33%.
2. Body temperature should be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature (OT) at the beginning of the rest period should not exceed 99.6°F. If it does, the next work period should be shortened by 10 minutes (or 33%), while the length of the rest period stays the same. However, if the OT exceeds 99.6°F at the beginning of the next period, the following work cycle should be further shortened by 33%. OT should be measured again at the end of the rest period to make sure that it has dropped below 99.6°F.
3. Body water loss (BWL) due to sweating should be measured by weighing the worker in the morning and in the evening. The clothing worn should be similar at both weighings;

preferably the workers should be nude. The scale should be accurate to plus or minus 1/4 lb. BWL should not exceed 1.5% of the total body weight. If it does, the worker should be instructed to increase his daily intake of fluids by the weight lost. Ideally, body fluids should be maintained at a constant level during the work day. This requires replacement of salt lost in sweat as well.

4. Good hygienic standards must be maintained by frequent change of clothing and daily showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

PERSONNEL MONITORING FOR HEAT STRESS

The Site Safety Officer or Response Manager will administer the following heat stress monitoring schedule required for those individuals performing CONTINUOUS work under the conditions listed below. The individual performing the monitoring will be familiar with the symptoms and first aid procedures for heat stress. Employees will be encouraged to monitor signs of heat stress among fellow employees via the "buddy system" when working in Levels B or C in temperatures above 85°F. The Site Safety Officer, Response Manager, or On-Scene Coordinator should be contacted immediately upon the notice of any signs of heat stress in fellow employees. Fluids will be made available to all workers during work breaks.

Individuals working in Level A will be monitored for heat stress during every work break and immediately upon PPE removal.

Temperature (°F)	Monitoring Frequency	
	Level D	Level B or C
>90	Every 45 mins	Every 15 mins
85-90	Every 60 mins	Every 30 mins
80-90	Every 90 mins	Every 60 mins
75-80	Every 120 mins	Every 90 mins

SIGNS AND SYMPTOMS OF HEAT STRESS

Heat Cramps

Caused by heavy sweating without electrolyte replacement. Signs and symptoms include muscle spasms and pain in the hands, feet, and abdomen.

Heat Exhaustion

Caused by increased cardiovascular stress or dehydration. Signs and symptoms include pale, cool, moist skin; heavy sweating; dizziness; nausea; and vomiting.

Heat Stroke

Failure of temperature regulation in the body. Most serious form of heat stress. Competent medical help required. Signs and symptoms include red, hot, dry skin; reduced perspiration; nausea, dizziness or confusion; strong, rapid pulse; or coma.

CORNELL-DUBILIER ELECTRONICS

DATE: _____ 1996

HEAT STRESS MONITORING LOG

[illegible]

Attachment C



Genium Publishing Corporation

1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(513) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 296
Arsenic and Compounds

Issued: 4/90

Section 1. Material Identification

31

Arsenic Description: Obtained from flue dust of copper and lead smelters as white arsenic (arsenic trioxide). Reduction with charcoal and sublimation in an N₂ current yields pure arsenic. Metallic arsenic is used for hardening copper, lead, and alloys; as a doping agent in germanium and silicon solid-state products, special solders, and medicine; and to make gallium arsenide for diodes and other electronic devices. Arsenic compounds are used in manufacturing certain types of glass; in textile printing, tanning, taxidermy, pharmaceuticals, insecticides and fungicides, pigment production, and antifouling paints; and to control sludge formation in lubricating oils. Arsenic trioxide is the source for 97% of all arsenic products.

Other Designations: CAS No. 7440-38-2; arsen; arsenic black; As; gray arsenic; metallic arsenic.

Manufacturers: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*TM for a suppliers list.

R 1
I 4
S 2
K 0

Genium



HNES
1 1
2 2
3 3
PPG*
* Sec. 3

Section 2. Ingredients and Occupational Exposure Limits

Arsenic and soluble compounds, as As

OSHA PEL

8-hr TWA: 0.5 mg/m³; * 0.01 mg/m³†

NIOSH REL, 1987

Ceiling: 0.002 mg/m³

Toxicity Data:

Man, oral, TD₀₁: 76 mg/kg administered intermittently over a 12-year period affects the liver (tumors) and blood (hemorrhage)

Man, oral: 7857 mg/kg administered over 55 years produces gastrointestinal (in the structure or function of the esophagus), blood (hemorrhage), and skin and appendage (dermatitis) changes

Rat, oral, TC₀₁: 605 µg/kg administered to a 35-week pregnant rat affects fertility (pre- and post-implantation mortality)

ACGIH TLV, 1989-90

TLV-TWA: 0.2 mg/m³

* Organic compounds.

† Inorganic compounds.

‡ See NIOSH, RTECS (CG0525000), for additional mutative, reproductive, tumorigenic, and toxicity data.

Section 3. Physical Data*

Boiling Point: sublimes at 1134 °F/612 °C

Atomic Weight: 74.92

Melting Point: 1497 °F/814 °C

Density: 5.724 at 57 °F/14 °C

Vapor Pressure: 1 mm at 702 °F/372 °C (sublimes)

Water Solubility: Insoluble†

Appearance and Odor: A brittle, crystalline, silvery to black metalloid. Odorless.

* This data pertains to arsenic only.

† Arsenic is soluble in nitric acid (HNO₃).

Section 4. Fire and Explosion Data

Flash Point: None reported

Autoignition Temperature: None reported

LEL: None reported

UEL: None reported

Extinguishing Media: Use dry chemical, CO₂, water spray, or foam to fight fires.

Unusual Fire or Explosion Hazards: Flammable and slightly explosive in the form of dust when exposed to heat or flame.

Special Fire-fighting Procedures: Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Arsenic is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Arsenic can react vigorously on contact with powerful oxidizers such as bromates, peroxides, chlorates, iodates, lithium, silver nitrate, potassium nitrate, potassium permanganate, and chromium (VI) oxide. This material is also incompatible with halogens, bromine azide, palladium, diisobutyl acrylate, zinc, and platinum.

Hazardous Products of Decomposition: Thermal oxidative decomposition of arsenic and its compounds produces irritating or poisonous gases.

Material Safety Data Sheet

from Genium's Reference Collection
Genium Publishing Corporation
1145 Catalvn Street
Schenectady, NY 12303-1836 USA
(518) 377-8855



No. 23

CADMIUM

(Revision C)

Issued: September 1977

Revised: November 1988

SECTION 1. MATERIAL IDENTIFICATION

27

Material Name: CADMIUM

Description (Origin/Uses): Used in electroplating other metals; in dentistry; in alloys; in nickel-cadmium batteries; and in reactor control rods.

Other Designations: Cd; CAS No. 7440-43-9

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyers' Guide* (Genium ref. 73) for a list of suppliers.



Genium

HMIS

H 3 R 1

F 1 I 4

R 0 S 1

PPG*

*See sect. 8 K 4 (Dust)

SECTION 2. INGREDIENTS AND HAZARDS, EXPOSURE LIMITS

Cadmium, CAS No. 7440-43-9, ca 100%

OSHA PEL

8-Hr TWA: 0.1 mg/m³ (Cd Fume)

Ceiling: 0.3 mg/m³ (Cd Fume)

8-Hr TWA: 0.2 mg/m³ (Cd Dust)

Ceiling: 0.6 mg/m³ (Cd Dust)

ACGIH NIC,* 1988-89

TLV-TWA: 0.01 mg/m³ (Cadmium and Compounds, as Cd)

ACGIH A2, Suspected Human Carcinogen

ACGIH TLVs, 1988-89

TLV-TWA: 0.05 mg/m³ (Cadmium Dusts and Salts, as Cd)

TLV-Ceiling: 0.05 mg/m³ (Cadmium Oxide Fume, as Cd)

TLV-TWA: 0.05 mg/m³ (Cadmium Oxide Production)

Toxicity Data**

Human, Inhalation, LC₅₀: 39 mg/m³ (20 Minutes)

*Notice of Intended Changes, Genium reference 116, p. 39.

**See NIOSH, RTECS (EU9800000), for additional data referring to reproductive, tumorigenic, and mutagenic effects.

SECTION 3. PHYSICAL DATA

Boiling Point: 1413°F (767°C)

Melting Point: 610°F (321°C)

Vapor Pressure: 0.095 Torr at 610°F (321°C)

Molecular Weight: 112 Grams/Mole

Solubility in Water (%): Insoluble

Specific Gravity (H₂O = 1): 8.642

Appearance and Odor: A soft, blue white, malleable, lustrous metal that can be cut easily with a knife; odorless.

Comments: Cadmium has a significant vapor pressure of 0.000021 torr (corresponding to 0.12 mg/m³) at 315°F (157°C). Heating this metal without using correct engineering controls and/or personal protective equipment can result in overexposure.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method*

Autoignition Temperature*

LEL*

UEL*

Extinguishing Media: *Cadmium metal burns readily in air if it is heated. As with most metals, the reactivity/dust-cloud-explosion hazard increases as the cadmium metal becomes more finely divided. In fact, finely divided, powdered cadmium metal can be pyrophoric (it burns spontaneously in air without any source of ignition). Carbon dioxide, dry chemical, or sand are recommended extinguishing agents for cadmium fires. Unusual Fire or Explosion Hazards: Cadmium dust can explode during a fire. Massive cadmium metal does not present this potential explosion hazard; however, certain work operations such as grinding, welding, or cutting, can produce dust made of finely divided cadmium particles. Warning: Do not create a dust cloud of cadmium particles, especially during cutting, grinding, or welding operations. Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

SECTION 5. REACTIVITY DATA

Stability/Polymerization: Cadmium is stable in closed containers during routine operations. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Cadmium reacts dangerously with ammonium nitrate, hydrazoic acid, tellurium, and zinc (Genium ref. 84).

Conditions to Avoid: Avoid all exposure to sources of ignition and to incompatible chemicals. Hazardous Products of Decomposition: When heated, which is likely during fires and work operations such as welding and machining, cadmium metal can decompose into cadmium metal fume and cadmium oxide fume.

SECTION 6. HEALTH HAZARD INFORMATION

Carcinogenicity: The ACGIH classifies cadmium and its compounds as suspected human carcinogens (group A2); the IARC lists them as probable human carcinogens (group 2B); and the NTP classifies them as anticipated human carcinogens (group b). Summary of Risks: Heating cadmium metal produces intensely irritating cadmium metal fume. The acute effects of its excessive inhalation, which include severe tracheobronchitis, pneumonitis, and pulmonary edema, are life threatening and are usually delayed for several hours; their mortality rate is about 20%. Nonfatal pneumonitis has resulted from exposure to 0.5 to 2.5 mg/m³; a fatality has been reported for five hours' exposure at 9 mg/m³ and for 1 hour's exposure at 40 to 50 mg/m³. There is no warning discomfort or immediate irritation from exposure to cadmium fume. Acute gastroenteritis and symptoms of metal fever are associated with even lower acute exposure. Symptoms of acute overexposure include excessive salivation, a dry, burning throat; headache; aching muscles; coughing; chest tightness and pain; nausea; chills, and fever chills; and fever. Medical Conditions Aggravated by Long-Term Exposure: None reported. Target Organs: Skin, eyes, respiratory system, kidneys, and blood. Primary Entry: Inhalation, skin contact. Acute Effects: See Summary of Risks, above. Chronic Effects: Long-term, chronic inhalation of cadmium dust, salts, or fume causes chronic cadmium poisoning characterized by a distinctive, nonhypertrophic emphysema with or without renal tubular injury, accompanied by the urinary excretion of a protein with a molecular weight



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Material Safety Data Sheets Collection:

Sheet No. 83
Chromium Metal/Powder

Issued: 3/81

Revision: A, 11/89

Section 1. Material Identification

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Chromium Metal/Powder Description: Obtained from chrome ore, chromite (FeCr_2O_4), by electrolysis of chromium solutions, by direct reduction (ferrochrome), and by reducing the oxide with finely divided carbon or aluminum. Used for chromeplating other metals; for greatly increasing metal resistance and durability; in manufacturing chrome-steel or chrome-nickel-steel alloys (stainless steel); as a constituent of inorganic pigments; as protective coating for automotive and equipment accessories; and in nuclear and high-temperature research.

Other Designations: Chrome; Cr; CAS No. 7440-47-3.

Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide* (Genium ref. 73) for a suppliers list.

R 1
I 4
S 1
K 1

Genium



HMIS

H 2

F 1

R 1

PPG*

* Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Chromium metal/powder, ca 100%

OSHA PEL

ACGIH TLV, 1988-89*

NIOSH REL, 1987†

Toxicity Data‡

8-hr TWA: 1 mg/m³

TLV-TWA: 0.5 mg/m³

8-hr TWA (for chromium metal and insoluble salts): 1 mg Cr/m³

Rat, implant, TD₀₁: 1200 µg/kg body weight administered intermittently over six weeks

* This TLV is applicable to Cr²⁺ and Cr³⁺ compounds. For water soluble and water-insoluble Cr⁶⁺, the 8-hr TWA is 0.05 mg Cr⁶⁺/m³. Certain water-insoluble Cr⁶⁺ compounds (zinc chromate, calcium chromate, lead chromate, barium chromate, strontium chromate, and sintered chromium trioxide) are designated as A1a (human carcinogen).

† The NIOSH REL (10-hr TWA) for carcinogen Cr⁶⁺ compounds is 1 µg/m³; for noncarcinogenic Cr⁶⁺ compounds (including chromic acid), the RELs (10-hr TWAs) are 25 µg/m³ and 50 µg/m³ (15-min ceiling). The noncarcinogenic compounds include mono- and dichromates of hydrogen, cesium, sodium, lithium, potassium, rubidium, ammonia, and Cr⁶⁺ (chromic acid anhydride). Any and all Cr⁶⁺ materials excluded from the noncarcinogenic group above are carcinogenic Cr⁶⁺ compounds.

‡ See NIOSH, RTECS (GB4200000), for additional data with references to tumorigenic effects.

Section 3. Physical Data

Boiling Point: 4788 °F (2642 °C)

Atomic Weight: 51.996 g/mol

Melting Point: 3452 °F (1900 °C)

Specific Gravity (H₂O = 1 at 39 °F (4 °C)): 7.2 at 68 °F (20 °C)

Vapor Pressure: 1 mm Hg at 2941 °F (1616 °C)

Water Solubility: Insoluble

Vapor Density (Air = 1): 1.79

Appearance and Odor: Steel-gray, lustrous metal; no odor.

Section 4. Fire and Explosion Data

Flash Point: None reported

Autoignition Temperature: Cloud, 1076 °F (580 °C); dust layer, 752 °F (400 °C)

LEL: Dust cloud explosion, 0.230 oz/ft³

UEL: None reported

Extinguishing Media: Use dry chemical or sand.

Unusual Fire or Explosion Hazards: Particle size and dispersion in air determine reactivity. Chromium powder explodes spontaneously in air, while chromium dust suspended in CO₂ is ignitable and explosive when heated.

Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

*One hundred percent of dust goes through a 74-µm sieve. A 140-mJ spark can ignite a dust cloud.

Section 5. Reactivity Data

Stability/Polymerization: Chromium is stable when properly handled and stored. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Chromium reacts readily with dilute, not nitric, acids to form chromous salts. It is soluble in acids (not nitric) and strong alkalis. Its powder is incompatible with strong oxidizing agents, including high O₂ concentration. Evaporation of mercury (Hg) from Cr amalgam leaves pyrophoric chromium. Finely divided Cr attains incandescence with nitrogen oxide, potassium chlorate, and sulfur dioxide. Molten lithium at 18 °C severely attacks Cr. Fused ammonium nitrate below 200 °C reacts explosively and may ignite or react violently with bromine pentafluoride.

Hazardous Products of Decomposition: Thermal oxidative decomposition of Cr can produce toxic chromium oxide fumes.

Chemical Database - Response Information Data Sheet

Preferred Name: NICKEL (ACGIH)

Regulatory Name: NICKEL

Chemical Source: NOEPA NOAA #: 4024

NFPA Codes H: 2 - Hazardous - use breathing apparatus
F: 3 - Ignites at normal temperatures
R: 2 - Violent chemical change possible
S:

General Description

Nickel catalyst, is extremely fine powdered nickel. It is greyish colored. Nickel catalyst is used to promote the chemical action in manufacturing synthetics and to process vegetable oil and petroleum. If exposed to air or moisture, it may become hot enough to ignite. It is insoluble in water and does not react with larger volumes of water. ((c) AAR, 1991)

Fire Hazard

Flammable/combustible material. May ignite itself if exposed to air. May re-ignite after fire is extinguished. May burn rapidly with flare-burning effect. Runoff to sewer may create fire or explosion hazard. (DOT, 1993)

Fire Fighting

Flood with water. Use dry chemical, graphite, or dry earth. ((c) AAR, 1991)

Protective Clothing

Wear appropriate chemical protective gloves, boots and goggles. Do not handle broken packages unless wearing appropriate personal protective equipment. Wash away any material which may have contacted the body with copious amounts of water or soap and water. ((c) AAR, 1991)

MATERIAL RATINGS

BARRICADE > 3 hrs[limited data]
BLUE MAX > 3 hrs[limited data]
PE > 3 hrs[limited data]
RESPONDER > 3 hrs[limited data]
SARANEX23P > 3 hrs[limited data]

These protective clothing recommendations are based on experimental data for another chemical with similar chemical properties and structure. Because material recommendations for chemicals in the same classification will generally, but not

Chemical Database - Response Information Data Sheet

Preferred Name: NICKEL (ACGIH)

always, be appropriate, use caution when following these recommendations.

Non-Fire Response

Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Keep material dry. ((c) AAR, 1991)

Health Hazard

If inhaled, may be harmful. Contact may cause burns to skin and eyes. Fire may produce irritating or poisonous gases. Runoff from fire control or dilution water may cause pollution. (DOT, 1993)

Properties

IDLH: 10 mg/m3 (as Ni); a potential human carcinogen (NIOSH, 1994)

TLV TWA: 0.5 mg/m3, Confirmed human carcinogen ((c)ACGIH, 1992)

First Aid

Move victim to fresh air; call emergency medical care. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. (DOT, 1993)

Personal Protective Methods: Wear appropriate clothing to prevent repeated or prolonged skin contact. Employees should wash daily at the end of each work shift. Work clothing should be changed daily if it is possible that clothing is contaminated. Remove nonimpervious clothing promptly if wet or contaminated.

Respirator Selection:

- 0.75 mg/m³: DXSPest
- 1.5 mg/m³: DXSQ/HiEPPest/SA/SCBA
- 7.5 mg/m³: HiEPPest/SAF/SCBAF
- 150 mg/m³: PAPHiEPPest/SA:PD,PP,CF
- 300 mg/m³: SAF:PD,PP,CF
- Escape: DXSPest/SCBA

Disposal Method Suggested: Long-term storage in large, weatherproof, and sift-proof storage bins or silos; small amounts may be disposed of in a chemical waste landfill (A-31).

References

- (1) Parmeggiani, L., Ed., *Encyclopedia of Occupational Health & Safety*, Third Edition, Vol. 2, pp 1205-1206, Geneva, International Labour Office (1983).
- (2) United Nations Environment Programme, *IRPTC Legal File 1983*, Vol. 1, pp VII/53-9, Geneva, Switzerland, International Register of Potentially Toxic Chemicals (1984).
- (3) Also see "Arsenic and Arsenic Compounds."

LEAD-INORGANIC

- Hazardous substances (Various compounds, EPA)
 - Lead compounds which are classified by EPA as hazardous substances include: lead acetate, lead arsenate (see separate entry), lead chloride, lead fluoborate, lead fluoride (see also "Fluorides"), lead iodide, lead nitrate, lead stearate, lead sulfate, lead sulfide, and lead thiocyanate.
- Hazardous waste constituents (EPA)
- Priority toxic pollutant (EPA)

Description: Pb, inorganic lead, includes lead oxides, metallic lead, lead salts, and organic salts such as lead soaps, but excludes lead arsenate and organic lead compounds. Lead is a blue-grey metal which is very soft and malleable. Commercially important lead ores are galena, cerussite, anglesite, crocoisite, wulfenite, pyromorphite, matlockite, and vanadinite. Lead is slightly soluble in water in presence of nitrates, ammonium salts, and carbon dioxide.

Code Numbers: Lead metal—CAS 7439-92-1 RTECS OF7525000

DOT Designation: —

Synonyms: None.

Potential Exposures: Metallic lead is used for lining tanks, piping, and other equipment where pliability and corrosion resistance are required such as in the chemical industry in handling corrosive gases and liquids used in the manufacture of sulfuric acid; in petroleum refining; and in halogenation, sulfonation, extraction, and condensation processes; and in the building industry.

It is also used as an ingredient in solder, a filler in the automobile industry, and a shielding material for x-rays and atomic radiation; in manufacture of tetraethyllead and organic and inorganic lead compounds, pigments for paints and

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varnishes, storage batteries, flint glass, vitreous enameling, ceramics as a glaze, litharge rubber, plastics, and electronic devices. Lead is utilized in metallurgy and may be added to bronze, brass, steel, and other alloys to improve their characteristics. It forms alloys with antimony, tin, copper, etc. It is also used in metallizing to provide protective coatings and as a heat treatment bath in wire drawing.

Exposures to lead dust may occur during mining, smelting, and refining, and to fume, during high temperature (above 500°C) operations such as welding or spray coating of metals with molten lead. There are numerous applications for lead compounds, some of the more common being in the plates of electric batteries and accumulators, as compounding agents in rubber manufacture, as ingredients in paints, glazes, enamels, glass, pigments, and in the chemical industry.

It is estimated that approximately 783,000 industrial workers are potentially exposed to lead products.

In addition to these usual levels of exposure from environmental media, there exist miscellaneous sources which are hazardous. The level of exposure resulting from contact is highly variable. Children with pica for paint chips or for soil may experience elevation in blood lead ranging from marginal to sufficiently great to cause clinical illness. Certain adults may also be exposed to hazardous concentrations of lead in the workplace, notably in lead smelters and storage battery manufacturing plants. Again, the range of exposure is highly variable. Women in the workplace are more likely to experience adverse effects from lead exposure than men due to the fact that their hematopoietic system is more lead-sensitive than men's.

Incompatibilities: Strong oxidizers, hydrogen peroxide, active metals—sodium, potassium.

Permissible Exposure Limits in Air: The Federal (OSHA) standard for lead and its inorganic compounds was 0.2 mg/m³ as a time-weighted average. The EPA has set a national ambient air quality standard for lead of 1.5 mg/m³ on a 3-month average basis. The NIOSH Criteria Document recommends a time-weighted average value of 0.15 mg Pb/m³. On November 14, 1978, OSHA set a final standard in which industries will be given 1 to 3 years to reach 0.1 mg (100 µg)/m³ level and from 1 to 10 years to reach a final standard of 0.05 mg (50 µg)/m³. ACGIH as of 1983/84 has set a TWA of 0.15 mg/m³ (as Pb) and an STEL of 0.45 mg/m³. Lead chromate is assigned a TWA of 0.05 mg/m³ by ACGIH (1983/84) with the notation that it is a substance suspect of carcinogenic potential for man.

Determination in Air: Collection on a filter, workup with nitric acid, analysis by atomic absorption spectrometry. See NIOSH Methods, Set O. See also reference (A-10).

Permissible Concentration in Water: To protect freshwater aquatic life— $e^{[2.35 \ln(\text{hardness}) - 9.48]}$

never to exceed

$$e^{[1.22 \ln(\text{hardness}) - 0.47]}$$

To protect saltwater aquatic life—668 µg/l on an acute toxicity basis and 25 µg/l on a chronic basis. To protect human health—50 µg/l (USEPA).

Various organizations worldwide have set other standards for lead in drinking water as follows (A-65): South African Bureau of Standards, 150 µg/l; World Health Organization, 100 µg/l; Federal Republic of Germany (1975), 40 µg/l.

Determination in Water: Digestion followed by atomic absorption or by

colorimetric (dithizone) analysis or by inductively coupled plasma (ICP) optical emission spectrometry. That gives total lead; dissolved lead may be determined by 0.45 micron filtration prior to such analyses.

Routes of Entry: Ingestion of dust; inhalation of dust or fume, skin and eye contact.

Harmful Effects and Symptoms: *Local* – None.

Systemic – The early effects of lead poisoning are nonspecific and, except by laboratory testing, are difficult to distinguish from the symptoms of minor seasonal illnesses. The symptoms are decreased physical fitness, fatigue, sleep disturbance, headache, aching bones and muscles, digestive symptoms (particularly constipation), abdominal pains, and decreased appetite. These symptoms are reversible and complete recovery is possible.

Later findings include anemia, pallor, a "lead line" on the gums, and decreased hand-grip strength. Lead colic produces an intense periodic abdominal cramping associated with severe constipation and, occasionally, nausea and vomiting. Alcohol ingestion and physical exertion may precipitate these symptoms. The peripheral nerve affected most frequently is the radial nerve. This will occur only with exposure over an extended period of time and causes "wrist drop." Recovery is slow and not always complete. When the central nervous system is affected, it is usually due to the ingestion or inhalation of large amounts of lead. This results in severe headache, convulsions, coma, delirium, and possibly death. The kidneys can also be damaged after long periods of exposure to lead, with loss of kidney function and progressive azotemia.

Because of more efficient material handling methods and biological monitoring, serious cases of lead poisoning are rare in industry today.

Points of Attack: Kidneys, blood, gingival tissue, gastrointestinal system, central nervous system.

Medical Surveillance: In preemployment physical examinations, special attention is given to neurologic and renal disease and baseline blood lead levels. Periodic physical examinations should include hemoglobin determinations, tests for blood lead levels, and evaluation of any gastrointestinal or neurologic symptoms. Renal function should be evaluated.

Periodic evaluation of blood lead levels are widely used as an indicator of increased or excessive lead absorption. Other indicators are urine coproporphyrin and delta aminolevulinic acid (ALA). Erythrocytic protoporphyrin determinations may also be helpful. See also reference (10).

First Aid: If this chemical gets into the eyes, irrigate immediately. If this chemical contacts the skin, flush with soap promptly. If a person breathes in large amounts of this chemical, move the exposed person to fresh air at once and perform artificial respiration. When this chemical has been swallowed, get medical attention. Give large quantities of water and induce vomiting. Do not make an unconscious person vomit.

Personal Protective Methods: Wear appropriate clothing to prevent repeated or prolonged skin contact. Wear eye protection to prevent any reasonable probability of eye contact. Employees should wash daily at the end of each work shift. Remove nonimpervious clothing immediately if wet or contaminated.

Respirator Selection:

- 0.5 mg/m³: HiEP
- 2.5 mg/m³: HiEPP
- 50 mg/m³: PAPHIE/SA:PD,PP,CF
- 100 mg/m³: SAF:PD,PP,CF

Disposal: ...
or carbonaceous ...
smelting ...
(A-31). ...
and returned ...
recycling ...
(A-57).

References

- (1) National ...
- (2) OSHA ...
- (3) U.S. ...
- (4) U.S. ...
- (5) U.S. ...
- (6) U.S. ...
- (7) U.S. ...
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- (9) U.S. ...
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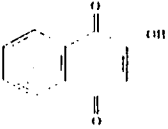
mp 44°. Practically insol in water; sol in ether, form, ethanol, ethylene dichloride.
 THERAP CAT: Antiseborrheic.

1. Lauryl Bromide. *1-Bromododecane*; dodecyl bromide, $\text{C}_{12}\text{H}_{25}\text{Br}$; mol wt 249.24. C 57.82%, H 10.11%, Br 32.07%. Prep'd by the action of hydrobromic acid on primary *n*-lauryl alcohol in the presence of K_2CO_3 ; Kamn, Marvel, *Org. Syn.* 1, 7 (1921). mp 175-180°. Insol in water. Sol in alc, ether.

2. Lavender. Garden lavender; true lavender. *Flow-Lavandula officinalis* Chaix (*L. vera* DC.), *Labiatae*. Mediterranean region. *Constit.* Volatile oil. For fumigating; in perfumery; to keep moths from manuf oil lavender. THERAP CAT: Pharmaceutical aid (perfume).

3. Lawrencium. Lr; formerly Lw; at. wt (longest-known isotope, Lr_{13} ~ 3 minutes) 260; at. no. 103; valence 3. Known isotopes 255-260. Discovery of first isotope by Ghiorso *et al.*, *Phys. Rev. Letters* 6, 473 (1961). Produced by bombardment of californium with boron ions; assigned mass number 257; later changed to 258 (2 seconds, α -emitter); Eskola *et al.*, *Phys. Rev.* C 4, 771. Prep'n of ^{258}Lr ($T_{1/2}$ ~ 45 seconds) by irradiating with ^{18}O ions; Donets *et al.*, *At. Energ. (USSR)* 19, 1965, *C.A.* 64, 1542c (1966). Prep'n of isotopes 255-bombardment of transuranium elements with heavy ions; Eskola *et al.*, *loc. cit.* Reviews of history, prep'n and uses: C. Keller, *The Chemistry of the Transuranium Elements* (Verlag Chemie, Weinheim, English Ed., 1971) pp 2-2; Silva, "Trans-Curium Elements" in *MFP Int. Rev. Inorg. Chem., Ser. One* vol. 8, A. G. Maddock, Ed., Interscience Park Press, Baltimore, 1972) pp 71-105; Ghiorso *et al.*, *Exp. Pharmacol.* 36, 691-715 (1973); Taylor, *ibid.* 7-738.

4. Lawsonite. *2-Hydroxy-1,4-naphthalenedione*; *2-hydroxy-1,4-naphthoquinone*, $\text{C}_{10}\text{H}_6\text{O}_4$; mol wt 174.15. C 57.47%, H 3.47%, O 27.56%. From leaves of *Lawsonia inermis* and *L. alba* Lam., *Lythraceae*; Latif, *Indian J. Agr. Sci.* 2-3, 147 (1959); *C.A.* 55, 14828g (1961). Synthesis: Fieser, *J. Am. Chem. Soc.* 70, 3165 (1948); Jain, *Proc. Indian Acad. Sci.* 35A, 233 (1952); Eistert, *Ber.* 92, 2071 (1959).



w prisms from acetic acid, dec 195-196°. THERAP CAT: Sunscreen agent.

5. Lazurite. Lapis lazuli; lazurite. Composition: $\text{Na}_4(\text{AlSi}_3\text{O}_{10})_2(\text{SO}_4)_2\text{S}_2\text{Cl}_2$. E. S. Dana, *A System of Mineralogy*, Wiley, New York, 6th ed., 1901) pp 432-433; C. But, Jr., *Dana's Manual of Mineralogy* (John Wiley, New York, 17th ed., 1959) p 503. Blue-violet or greenish-blue, translucent, cubic or octahedral crystals. d 2.4. Dec by HCl with pptn of SiO_2 solution of H_2S . In manuf of vases, ornamental furniture, mosaics; in jewelry.

6. LBF. Lactobacillus bulgaricus factor. Growth occurring in products derived from both animal and vegetable sources and in culture filtrate of certain microorganisms; Williams *et al.*, *J. Biol. Chem.* 177, 933 (1949); Vitucci *et al.*, *Arch. Biochem. Biophys.* 34, 409 (1951); Peters *et al.*, *J. Biol. Chem.* 75, 1688 (1953). Contains pantetheine *q.v.*

each being a mixed disulfide of Rasmusen *et al.*, *Proc. Soc. Exp. Biol. Med.* 73, 658 (1950); Brown, Snell, *J. Biol. Chem.* 198, 375 (1952). Coenzyme A digested with intestinal phosphatase shows 2-4 LBF-active components: Long, Williams, *J. Bacteriol.* 61, 195 (1951). Review: Snell, Brown, "Pantetheine and Related Forms of the Lactobacillus Bulgaricus Factor (LBF)" in *Advan. Enzymol.* 14, 49-71 (1953).

5227. Lead. Pb; at. wt 207.2; at. no. 82; valence 2, 4. Four naturally occurring isotopes: 204 (1.40%); 206 (25.2%); 207 (21.7%); 208 (51.7%); artificial, radioactive isotopes: 195-203; 205; 209-214. One of the metals known to the ancient world. Extent of occurrence in earth's crust about 15 g/ton, also expressed as 0.002% (depth of crust: 16 km). Occurs chiefly as sulfide in galena, other minerals include anglesite (PbSO_4), cerussite (PbCO_3), mimetite [$\text{PbCl}_2 \cdot 3\text{Pb}_2(\text{AsO}_4)_3$] and pyromorphite [$\text{PbCl}_2 \cdot 3\text{Pb}_2(\text{PO}_4)_3$]. Recovery from ore and purification: Heuser, *Mettall.* 9, 675 (1955), *C.A.* 49, 14609 (1955); Ziegfeld, *Eng. Mining J.* 153, 82 (1952). *C.A.* 46, 2975 (1952). Prep'n of high purity lead: Piontelli, Fagnani, *Chim. Ind. (Milan)* 34, 629 (1952). *C.A.* 47, 12062 (1953); Giesen, *Technik (Berlin)* 2, 393 (1947). *C.A.* 42, 852 (1948); Hughes *J. Electrochem. Soc.* 101, 267 (1954); Baralis, Marone, *Met. Ital.* 59, 494 (1967). *C.A.* 67, 119613a (1967). Reviews of lead, its alloys and compds: W. Hofmann, *Lead and Lead Alloys, Properties and Technology* (Springer, New York, Eng. Ed., 1970) 551 pp; Abel in *Comprehensive Inorganic Chemistry* vol. 2, J. C. Bailar, Jr. *et al.*, Eds. (Pergamon Press, Oxford, 1973) pp 105-146; H. E. Howe in *Kirk-Othmer Encyclopedia of Chemical Technology* vol. 14 (Wiley-Interscience, New York, 3rd ed., 1981) pp 98-139. Review of carcinogenicity studies of lead and lead compds: *IARC Monographs* 23, 325-415 (1980).

Bluish-white, silvery, gray metal. Highly lustrous when freshly cut, tarnishes upon exposure to air. Very soft and malleable, easily melted, cast, rolled, and extruded. Cubic crystal structure. mp 327.4°; bp 1740°. d_4^{20} 11.34; d at mp 10.65; Schneider *et al.*, *Naturwiss.* 41, 326 (1954). Heat of vaporization (1740°) 206 cal/g. Heat capacity (20°): 0.031 cal/g°C. Resistivity (μ -ohm-cm) at 20°: 20.65; at 100°: 27.02; at 320°: 54.76; at 330°: 96.74. Vapor pressure at 1000°: 1.77 mm Hg. E° (aq) Pb/Pb^{2+} +0.126 v. Coefficient of linear expansion (0-100°) 29×10^{-6} , (20-300°) 31.3×10^{-6} , (-183° to +14°) 27×10^{-6} ; thermal conductivity varies from 0.083 at 50° to 0.077 at 225°; Francel, Kingery, *J. Am. Ceram. Soc.* 37, 80 (1954); viscosity of molten lead (327.4°) 3.2 centipoises, (400°) 2.32 cp, (600°) 1.54 cp, (800°) 1.23 cp. Heat capacity and heat of fusion study: Douglas, Dever, *J. Am. Chem. Soc.* 76, 4824 (1954); hardness 1 on Mohs' scale; Brinell hardness (high purity Pb) 4.0; McLehlan, *Am. Mineralogist* 30, 635 (1945). Reacts with hot concd nitric acid, with boiling concd hydrochloric or sulfuric acid. Attacked by pure water, weak organic acids in the presence of oxygen. Resistant to tap water, hydrofluoric acid, brine, solvents.

Human Toxicity: *Acute:* most common in young children with history of pica; anorexia, vomiting, malaise, convulsions due to increased intracranial pressure. May leave permanent brain damage. Blood lead increased above 0.05 mg %. *Chronic:* children show weight loss, weakness, anemia. Lead poisoning in adults is usually occupational due mainly to inhalation of lead dust or fumes. Wristdrop and colic rarely occur. More often there are vague G.I. and CNS complaints. Pb content of blood > 0.05 mg % and of urine > 0.08 mg per liter support a diagnosis of Pb poisoning. Provocative excretion test using Edathamil may be helpful in confirming excess Pb absorption. Review of toxicity: *Clinical Toxicology of Commercial Products*, R. E. Gosselin *et al.*, Eds. (Williams & Wilkins, Baltimore, 4th ed., 1976) Section III, pp 194-202; *Lead Toxicity*, R. L. Singhal, J. A. Thomas, Eds. (Urban & Schwarzenberg, Baltimore, 1980) 514 pp.

USE: Construction material for tank linings, piping, and other equipment handling corrosive gases and liqs used in the manuf of sulfuric acid, petr refining, halogenation, sulfonation, extraction, condensation; for x-ray and atomic radiation protection; manuf of tetraethyllead, pigments for paints, and other organic and inorganic lead compds; bear-

ing other metal alloys; in the metallurgy of steel and other metals. Review of uses, corrosion metallurgy: Mullarkey, *Ind. Eng. Chem.* 49, 1607 (1957).

5228. Lead Acetate. Neutral lead acetate; normal lead acetate; sugar of lead; salt of Saturn. $\text{C}_4\text{H}_6\text{O}_4\text{Pb}$; mol wt 325.28. C 14.77%, H 1.86%, Pb 63.70%, O 19.67%. $\text{Pb}(\text{CH}_3\text{COO})_2$. Trihydrate, colorless crystals or white granules or powder; slight acetic odor; slowly effloresces. *Poisonous!* Takes up CO_2 from air and becomes incompletely sol. d 2.55. mp 75° when rapidly heated; at a little above 100° it begins to lose acetic acid; dec completely above 200°. One gram dissolves in 1.6 ml water, 0.5 ml boiling water, 30 ml alcohol; freely sol in glycerol. Aq solns of lead acetate dissolve lead monoxide. pH of 5% aq soln at 25° = 5.5-6.5. *Keep well closed.* *Incompat:* Acids, sol sulfates, citrates, tartrates, chlorides, carbonates, alkalis, tannin, phosphates, resorcinol, salicylic acid, phenol, chloral hydrate, sulfites, vegetable infusions, tinctures. LD₅₀ i.p. in rats: 200 mg/kg, Bendley, Frederick, *Ind. Med. 10, Ind. Hyg. Sect.* 2, 15 (1941).

Warning! Avoid breathing dust. Wear dust mask approved by U.S. Bureau of Mines for this purpose. Wash thoroughly before eating or smoking. Keep away from feed or food products. This substance has been listed as a carcinogen in the *Second Annual Report on Carcinogens* (NTP 81-43, Dec. 1981) pp 149-151.

USE: Dyeing and printing cottons; weighting silks; manuf lead salts, chrome-yellow; also for various analytical procedures, e.g. detection of sulfide, determination of CrO_3 , MoO_3 .

THERAP CAT: Astringent.

THERAP CAT (VET): Astringent and sedative (usually in lotions) for bruises and superficial inflammation. Has been used internally in diarrheas.

5229. Lead Antimonate(V). Naples yellow. Approx $\text{Pb}_3(\text{SbO}_4)_2$. Orange-yellow powder. Insol in water, dil acids. USE: As pigment in oil painting, staining glass, crockery and porcelain.

5230. Lead Arsenate. Approx PbHAsO_4 . Occurs in nature as the mineral *schultenite*. White, heavy powder. *Poisonous!* d 5.79. At about 280° loses H_2O and is converted into pyroarsenate. Insol in water; sol in HNO_3 , caustic alkalis. LD₅₀ in rats, rabbits: approx 825, 125 mg/kg orally, Voigt *et al.*, *J. Am. Pharm. Assoc.* 37, 122 (1948).

USE: As constituent of various insecticides for larvae of gypsy moth, boll weevil, etc.

THERAP CAT (VET): Has been used as a teniacide; insecticide.

5231. Lead Arsenite. Approx $\text{Pb}(\text{AsO}_2)_2$. White powder. *Poisonous!* d 5.85. Insol in water; sol in dil HNO_3 . USE: As insecticide like the arsenate.

5232. Lead Azide. N_4Pb ; mol wt 291.26. N 28.86%, Pb 71.14%. $\text{Pb}(\text{N}_3)_2$. Prep'd from sodium azide and lead nitrate: Schenk in *Handbook of Preparative Inorganic Chemistry* vol. 1, G. Brauer, Ed. (Academic Press, New York, 2nd ed., 1963) p 763. Most complete description: B. T. Fedoroff *et al.*, *Encyclopedia of Explosives and Related Items* vol. 1 (Picatinny Arsenal, Dover, N.J., 1960) pp A545-A587. Needles or white powder. Explodes at 350° or on percussion. Heat of formation (25°): +110.5 kcal/mol. Soly in water: 0.023% at 18°; 0.09% at 70°. Freely sol in acetic acid. Insol in NH_4OH .

USE: As primer in explosives. Generally used in the form of dextrinated lead azide.

5233. Lead Borate. Approx $\text{Pb}(\text{BO}_2)_2 \cdot \text{H}_2\text{O}$. White powder. *Poisonous!* Insoluble in water; soluble in dil HNO_3 .

USE: Drier for varnishes and paints; with other metals (e.g., Ag) in galvanoplasty for production of conducting coatings on glass, pottery, porcelain, and chinaware.

Monohydrate, colorless at 180°. Slightly sol in cold water. Pure lead bromate by pptg lead acetate with nitrate or explode on heating, acetate is occluded.

5235. Lead Bromide. PbBr_2 . White, cryst powder. *Poisonous!* Solidifying forms a horn-like cold water, 20 parts boiling;

5236. Lead Butyrate. $\text{C}_4\text{H}_7\text{O}_2\text{Pb}$; mol wt 381.40. C 54.33%, $\text{Pb}(\text{C}_4\text{H}_7\text{O}_2)_2$. Colorless scales or viscid Insol in water; sol in dil H

5237. Lead Chlorate. $\text{Pb}(\text{ClO}_3)_2$. 18.95%, O 25.66%, Pb 55.3%. Colorless, deliquescent crystals. Sol in 0.7 part water

5238. Lead Chloride. PbCl_2 . 74.50%, PbCl_2 . Occurs in nature. White, cryst powder. 1950°. Sol in 93 parts cold readily sol in soln of NH_4 slowly in glycerol. MLT g/kg. *Handbook of Toxic* (Saunders, Philadelphia, 1971) pp 176-177.

USE: Manuf Patison's Yellow, lead

5239. Lead Chromate(VI). PbCrO_4 . Low; King's yellow; Leipzig Yellow; PbCrO_4 . 16.09%, O 19.80%, Pb 64.11%. The minerals: *crocoite*, *phos-* vol. 4 (3rd ed., 1971) p 46. Yellow or orange-yellow. One of the most insol salts; acid; sol in solns of fixed LD₅₀ i.p. in guinea pigs: 125 mg/kg, 1, W. S. Spector, *ibid.* pp 176-177.

USE: Pigment in oil and decorating china and porcelain substances; in traffic

Note: Basic lead chromate from brown-yellow to red

5240. Lead Chromate(VI). PbCrO_4 . (2:1) salt (1:2); basic lead chromate red; chromium cinnabar. CrPb_2O_6 ; mol wt 14.64%. $\text{PbCrO}_4 \cdot \text{PbO}$. *Sol.* 1971) p 4677. Red powder. Insol in water. USE: As pigment.

5241. Lead Dioxide. PbO_2 . 86.62%. Occurs in nature prep'n from lead acetate and Maxson, *Inorg. Syn.* 1, 45. Note: Kuhn, Hammer, *Ber.* Dark-brown powder; evolving Pb_2O_3 at high temp sol in HCl with evolution of H_2O , oxalic acid, or other with liberation of iodine; s LD₅₀ i.p. in guinea pigs: 200 mg/kg, 1, W. S. Spector, *ibid.* pp 176-177.

USE: Electrodes in batteries; as discharge in dyeing

Material Safety Data Sheet

from Genium's Reference Collection

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GENIUM PUBLISHING CORP.

No. 683

POLYCHLORINATED BIPHENYLS
(PCBs)

Issued: November 1988

SECTION 1. MATERIAL IDENTIFICATION

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Material Name: POLYCHLORINATED BIPHENYLS (PCBs)

Description (Origin/Uses): Commercial PCBs are mixtures that were once widely manufactured by combining chlorine gas, iron filings, and biphenyls. Their high stability contributes to their intended commercial applications and their accidental, long-term adverse environmental and health effects. PCBs are useful as insulators in electrical equipment because they are electrically nonconductive. Their distribution has been limited since 1976. The Aroclor PCB codes identify PCBs by type. The first two digits of a code indicate whether the PCB contains chlorinated biphenyls (12), chlorinated terphenyls, (54), or both (25, 44); the last two digits indicate the approximate percentage of chlorine. Found in insulating liquid, synthetic rubber, plasticizers, flame retardants, floor tile, printer's ink, paper and fabric coatings, brake linings, paints, automobile body sealants, asphalt, adhesives, electrical capacitors, electrical transformers, vacuum pumps, gas-transmission turbines, heat-transfer fluids, hydraulic fluids, lubricating and cutting oil, copying paper, carbonless copying paper, and fluorescent light ballasts.

Synonym: Chlorodiphenyls

Other Designations (Producer, Trade Name, Nation): Monsanto, Aroclor® (USA, Great Britain); Bayer, Clophen® (German Democratic Republic); Prodelec, Phenoclor®, Pyralene® (France); Kanegafuchi, Kanechlor®, Mitsubishi, Santotherm® (Japan); Caffaro, Fencior® (Italy).

Trade Name	CAS No.	RTECS No.	Trade Name	CAS No.	RTECS No.	HMIS
Aroclors	01336-36-3	TQ1350000	Aroclor 1242	53469-21-9	TQ1356000	H 1 R 1
Aroclor 1016	12674-11-2	TQ1351000	Aroclor 1248	12672-29-6	TQ1358000	F 1 I 3
Aroclor 1221	11104-28-2	TQ1352000	Aroclor 1254	11097-69-1	TQ1360000	R 0 S 1
Aroclor 1232	11141-16-5	TQ1354000	Aroclor 1260	11096-82-5	TQ1362000	PPG* K 1

SECTION 2. INGREDIENTS AND HAZARDS/EXPOSURE LIMITS

PCB-42% Chlorine/Aroclor 1242	PCB-54% Chlorine/Aroclor 1254	All PCBs/Aroclors
CAS No. 53469-21-9	CAS No. 11097-69-1	CAS No. 1336-36-3
OSHA PEL (Skin*)	OSHA PEL (Skin*)	NIOSH REL 1977
8-Hr TWA: 1 mg/m ³	8-Hr TWA: 0.5 mg/m ³	10-Hour TWA: 0.001 mg/m ³
ACGIH TLV (Skin*), 1988-89	ACGIH TLV (Skin*), 1988-89	Toxicity Data**
TLV-TWA: 1 mg/m ³	TLV-TWA: 0.5 mg/m ³	Mouse, Oral, LD ₅₀ : 1900 mg/kg

*This material can be absorbed through intact skin, which contributes to overall exposure.

**See NIOSH, RTECS (Genium ref. 90), at the locations specified in section 1 for additional data with references to tumorigenic, reproductive, mutagenic, and irritative effects.

SECTION 3. PHYSICAL DATA

Boiling Point: Ranges from 527°F (275°C) to 725°F (385°C)	% Volatile by Volume: Ranges from 1.2 to 1.6
Solubility in Water (%): Insoluble	Molecular Weight (Average): Aroclor 1242: 258 Grams/Mole
Pour Point: Ranges from -31°F (-35°C) to 87.8°F (31°C)	Aroclor 1254: 326 Grams/Mole

Appearance and Odor: Clear to light yellow mobile oil to a sticky resin; a sweet "aromatic" odor. As the percentage of chlorine increases, the PCB becomes thicker and heavier; e.g., Aroclor 1254 is more viscous than Aroclor 1242.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point*	Autoignition Temperature: Not Found	LEL: Not Found	UEL: Not Found
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Extinguishing Media: Use water spray/fog, carbon dioxide (CO₂), dry chemical, or "alcohol" foam to extinguish fires that involve polychlorinated biphenyls. Although it is very difficult to ignite PCBs, they are often mixed with more flammable materials (oils, solvents, etc.)

Unusual Fire or Explosion Hazards: If a transformer containing PCBs is involved in a fire, its owner may be required to report the incident to appropriate authorities. Consult and follow all pertinent Federal, state, and local regulations. Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode; fire fighters must also wear a complete set of protective clothing. Comments: The hazards of PCB fires are associated with the possibility of their being released into the environment where they and their products of degeneration can pose serious long-term health risks. These potential problems are heightened by the PCBs' resistance to biological and chemical degradation and by the possibility that they will contaminate underground water systems (see sect. 5)

*Ranges from 284°F (140°C) to 392°F (200°C).

SECTION 5. REACTIVITY DATA

Stability/Polymerization: Polychlorinated biphenyls are very stable materials. Hazardous polymerization cannot occur.

Chemical Incompatibilities: PCBs can react dangerously with sodium or potassium. These reactions are part of an industrial process used to destroy PCBs; however, people have been killed by explosions at PCB treatment, storage, and disposal sites. Conditions to Avoid: Limit human exposure to PCBs to the lowest possible level; especially avoid contact with skin. Hazardous Products of Decomposition: Thermal-oxidative degradation of PCBs can produce toxic gases such as carbon monoxide, chlorine, chlorinated aromatic fragments, phenolics, aldehydes, and hydrogen chloride. Incomplete combustion of PCBs produces toxic compounds such as polychlorinated dibenzofuran (PCDF, the major product of combustion), and polychlorinated dibenzo-*p*-dioxin (PCDD or dioxin).

Material Safety Data Sheet

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No. 181

SILVER

Issued: April 1986

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SECTION 1. MATERIAL IDENTIFICATION

MATERIAL NAME: SILVER

DESCRIPTION: Elemental metal.

OTHER DESIGNATIONS: Ag, Argentum, CAS #7440-22-4.

MANUFACTURER/SUPPLIER: Available from many suppliers.

COMMENTS: Photography products account for 30% of industrial consumption. Additional uses include electrical conductors, coins, silverware, and jewelry.

HMIS

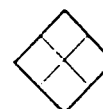
H:1

F:0

R:0

PPE*

*See sect. 8



Not Found

SECTION 2. INGREDIENTS AND HAZARDS

%

HAZARD DATA

Silver, Ag

99+

TWA 0.1 mg/m³*

TWA 0.01 mg/m³**

Rat, Implant, TD: 2570 mg/kg

* Current (1985-86) ACGIH TLV for silver dust and fume.

** Current (1985-86) ACGIH TLV for soluble silver compounds and OSHA exposure limit.

SECTION 3. PHYSICAL DATA

Boiling Point ... 3833.6°F (2112°C)

Vapor Pressure ... Not Found

Water Solubility ... Insoluble

Vapor Density (Air = 1) ... Not Found

Evaporation Rate ... Not Found

Specific Gravity (H₂O = 1) ... 10.5

Melting Point ... 1763.4°F (961.9°C)

Percent Volatile by Volume ... Not Found

Molecular Weight ... 107.87

Appearance and odor: Ductile and malleable lustrous white metal.

SECTION 4. FIRE AND EXPLOSION DATA

LOWER

UPPER

Flash Point and Method

Autoignition Temp.

Flammability Limits In Air

Not Found

Not Found

Not Found

Not
Applicable

Not
Applicable

NFPA Classification: Noncombustible.

EXTINGUISHING MEDIA: Use proper extinguisher for surrounding fire.

UNUSUAL FIRE/EXPLOSION HAZARDS: None.

SPECIAL FIRE-FIGHTING PROCEDURES: None.

SECTION 5. REACTIVITY DATA

Silver is stable. Hazardous polymerization cannot occur.

CHEMICAL INCOMPATIBILITIES: Acetylene and silver form an insoluble, explosive acetylide. If silver is treated with nitric acid in the presence of ethyl alcohol, silver fulminate may be formed, which can be detonated.

Ethylenimine forms explosive compounds with silver. Finely divided silver and hydrogen peroxide solutions may explode.

This material is incompatible with oxalic and tartaric acid. Ammonia plus silver may form explosive compounds.

Bromoazide explodes on contact with silver foil.

Attachment D

SITE SAFETY PLAN ACKNOWLEDGMENT FORM

I hereby acknowledge that I have read, do understand and will abide by all provisions set forth in the Health and Safety Plan for the Cornell-Dubilier Electronics Site.

[illegible]

Attachment E

SUMMARY OF POTENTIAL TOXICOLOGICAL EFFECTS

		Eye, Skin, Mucous Membrane Irritation									
		Respiratory System									
		Cardiovascular System									
		Liver Damage									
		Kidney Damage									
		Central Nervous System									
		Blood									
		Carcinogenic *									
		Mutagenic *									
CAS No.	Chemical										Teratogenic *
7440-38-2	Arsenic	X	X				X	X	X		
1336-36-3	Polychlorinated biphenyls (PCBs)	X			X		X		X		X
7440-43-9	Cadmium	X				X					
7440-47-3	Chromium (6+)	X	X						X		
7439-97-6	Mercury	X	X		X	X	X			X	X
7440-02-0	Nickel	X	X					X	X		X
7439-92-1	Lead	X				X	X	X			X
7440-22-4	Silver	X								X	

* - If chemicals revealed any evidence of these effects, i.e., suspected vs. confirmed, that effect was noted in the table.